THE ENGINEERING AND MINING JOURNAL.

VOL. XIII.—No. 12.—FOURTH SERIES.] NEW YORK, TUESDAY, MARCH 19, 1872. PRICE 10 CENTS PER COPY.

Continuous Jigger.

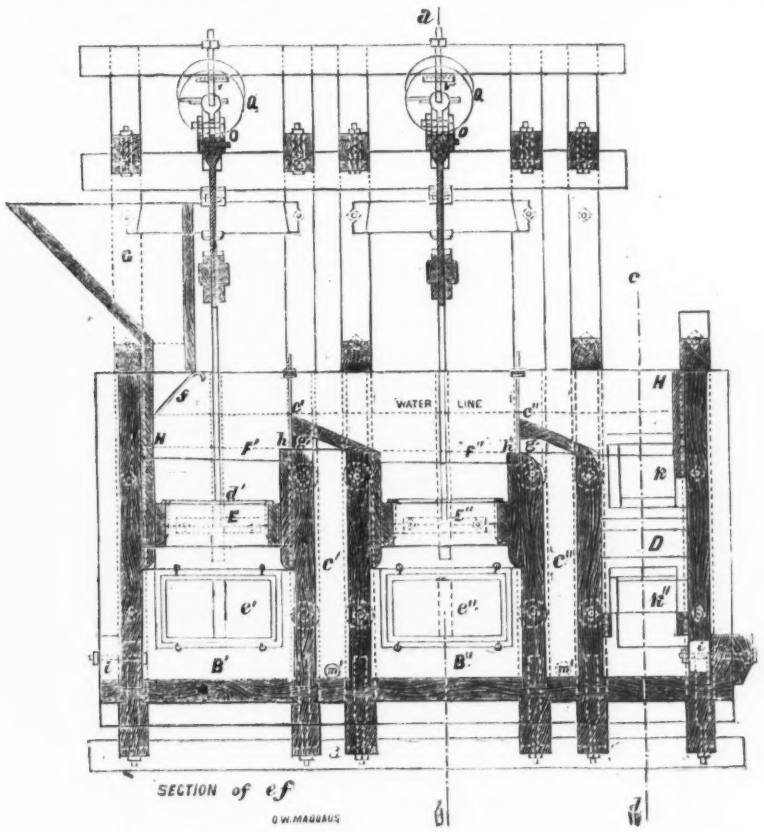
Designed by F. M. STAPFF, Ph. D., M. E.

HAVING tested the efficiency of the jigger here delineated, I beg leave to recommend it for trial and free use of the American mining community, at the same time preventing its being patented by publishing this description. I do not claim the entire invention of an apparatus which is a combination of parts frequently and and successfully used in jiggers of different construction; it being easy enough for experts to recognise those new and essential features in arrangement and construction, by which my machine surpasses similar ones of older date.

The cut subjoined represents a machine built in full accordance with my designs, which was constructed at Bethlehem (Pa.), for the Dolores lead mine (Mexico). The ores from this mine, galena and black carbonate of lead, are associated with small quantities of zinc-blende, copper, and iron pyrites; they contain calcspar as essential gangue, and are easily dressed. But in Sweden I have made good use of quite similar jigging-apparatus for dressing copper ores, containing copper pyrites, iron pyrites and blende in a gangue of quartz, hornblende, and other silicates.

SIZING.

It should be understood that the jigger is constructed for the treatment of sized stuff. We cannot here enter into a description of sizing machines, and will only mention that the size of meshes in the sizing screens, and the number of screens subsequently used, must be made dependent upon the specific gravity of the minerals to be separated by the jigging process. For the separation of calc-spar and zinc-blende from galena (Dolores), the width of meshes in subsequent sizing-screens should be about 1.00, 0.64, 0.41, 0.26, 0.17, 0.11, 0.07, 0.04 inches when perforated plates with round holes, or, 0.70, 0.44, 0.29, 0.18, 0.12, 0.07, 0.05 inches, when wire gauze with square holes is used. Stuff passing through 0.04 inch meshes is too fine, and stuff remaining upon ¼ to 1 inch meshes too coarse for proper treatment by our jigg, which, however, by some slight alterations in constructive details, can be made fit also for the working of coarser or finer stuff. All material fed on the jigg should be free from dust.



STAPFF'S CONTINUOUS JIGGER.

GENERAL ARRANGEMENT AND MODUS OPERANDI.

The mainbox contains six compartments, viz: A, open for the circulating water; B' and B", containing the pump-pistons E and E"; C' and C", receptacles for the jigged products; D, a space for filtration of the water from the refuse. The raising pistons press water through the sieve-beds, F' and F", whilst they draw water from A through the valves, e' and e", to the chambers B' and B". A consequence of the water's raising in B' and B", and of its sinking at the same time in A, is a current from left to right along the sieve beds to D, and thence through the holes, k' and k", back to A, by which the medium water level in the whole vessel is restored. The valves, d" d", allow the water to pass through the sinking pistons, so that there is no suction against the sieve-beds, and no current from right to left is effected by the back-stroke of pistons. Sized stuff fed upon the sieve-bed F', from hopper G, is jigged by the thrusts of water from below; but at the same time being exposed to the horizontal water current, its lighter particles are carried across the ridge c', and after being exposed to a new jigging operation on sieve-bed F", the refuse is carried across the ridge, c", to the chamber, D. The heaviest parts of the jigged ore move close along the sieve-beds F' and F", and enter the receptacles C" and C', through the gates g' and g", respectively. Screens of woven wire, attached before the holes k' and k", prevent the refuse from being carried to chamber A. Along the inclined screen l", Fig. III, the refuse is led to a discharge opening, m." Continual feeding from hopper G is regulated by moving

the plate *f*, which allows more or less stuff to be drawn from the hopper by the fluctuations of the water. The regular horizontal movement of the ore from left to right is promoted by a slope of sieve beds of 1 to 36. By slides *h'* anh *h"* in front of the openings *g'* and *g"*, the quantity of products entering the receptacles c' and c", is so regulated that the upper surface of the ore in process of treatment is about level with the ridges c' and c". If plenty of water (one cubic foot per second) can be disposed of, the discharge through the holes m', m", m"', from the chambers c', c" and D, should be continual; but if water is scarce, the receptacles c' and c" are emptied periodically. The refuse-hole m"' should never be totally closed, in order to allow the refuse to escape continually with a certain quantity of water, which has to be replaced from above.

The pistons, by through-rods and cross-heads connected with levers O, receive their movement from cams L, working against the lever. It being favorable for the jigging process, if the pistons sink slowly, but raise rapidly, the down-stroke is done directly by cam, whilst the up-stroke is effected by a counterpoise Q on the end of lever O. By alteration of the weight of this counterpoise, the velocity of the raising pistons may be changed at pleasure. Fine ore must be jigged by short strokes, coarse ore by long ones. For changing the length of stroke at pleasure, a set-screw *l* is placed over the guide-bar *v* of the lever O. By this means the backarm of lever O can be raised so much that the cam L does not catch the head of the other leverarm at all. Then the piston will rest, though the cam-axle is rotating;* or it can be lowered so much as to allow the cam to catch the leverhead 3 to 4" above the releasing points, and then the stroke will be about 3". The set-screw can be moved along the guide-bar whilst the machine is in full motion. An elastic cushion of rubber, *r*, is applied above the set-screw, to moderate the shocks of the falling lever.

All other circumstances unchanged, the quantity of ore jigged in a certain time depends essentially upon the number of piston strokes. But this number must not be increased so much, that the ore on the bed has not time enough to settle between two strokes; consequently the jigg should be run slowly (about 60 strokes a minute), if coarse ore is jigged by long strokes, and fast (about 180 strokes a minute), if the finest ore is jigged by very short strokes. The most favorable number of strokes in any case can easily be produced by running the driving-belt on one of the three pullies of different diameter on the same cam-shaft.

From the preceding it is easy enough to see the wide applicability of this jigger. If the hopper is regularly filled, and everything else regulated in accordance with the nature of the ore jigged, viz: supply of water, number and length of strokes, (feeding by regulator f), discharge (by regulators, g' g"), outlet of water, products and refuse (by holes, m' m' m"), the receptacle, c' will receive the heaviest ore, receptacle c", an intermediate class of ore, box D, gangue, or rock fit for the stamp mill. The products of the jigging process, and the further operations they have to pass through, vary in accordance with the mineralogical character and the size of the treated material. Fine Dolores ore will give galena and lead carbonate in receptacle c', blende in receptacle c", and calcspar in box D; coarse Dolores ore, galena and carbonate in c', blende, mixed with galena, carbonate and spar in c", spar, with little blende, and traces of lead ore in D. In this case it is necessary to submit the crushed products from c" and D to further dressing operations.

The power necessary to drive this jigger depends upon the area of pistons, and upon the number and length of piston strokes. Half a horse-power is in all cases sufficient to work a jigger of 18x18 inches piston area.

The quantity of material worked in a certain time is greatest if the stuff is rich and of middle size. Of poor copper ore, 6 to 7 feet are worked in an hour.

SOME DETAILS OF CONSTRUCTION.

Most of the constructive details of a jigger built of wood can be seen from the cut, without further explanation. If acid water is to be used for the jigging operation, wood is the best material; and, besides, it is the cheapest. Leaks in a well-constructed wooden jigger-box are usually caulked by dirt after the jigger has been used for some time, and besides it is of no practical account if a few drops of water leak from a vessel through which 1-3 to 1 cubic foot is run per second. The outside walls of the jigger-box should be at least 3 inches thick, the interior partition walls 2 to 2 1-2 inches. The planks forming these walls should be united by hard-wood wedges filling grooves. It must be remembered, that soft and dry wood expands transversely about ¼ inch per foot by soaking. A wooden box constructed in accordance with the cut remains not only tight enough, but it can also be easily taken apart, and put together. Grooves in the side-walls hold the bottom, which is stiffened by transverse rails; the end walls are fastened in the bottom and side walls, the long partition in the bottom and the end walls, the short partitions in the bottom, long partition and front wall. Bottom rails and posts form a frame around the box, and by pieces between the rear wall and long partition wall the whole construction is secured. The discharge holes m' m" m"' should not be closed otherwise than by wooden plugs or exterior trap-doors, which, by weights working on knee levers are pressed against nozzles. Close above the bottom are gates *i* for cleaning the chambers A B' B" D' when they become obstructed by dirt.

The pistons do not slide directly on the walls of partitions B' and B" but on hard wood linings, which can be replaced, piece by piece, if necessary. The main valves c' and c", of rubber, are stiffened by thin sheet-covers; their wooden valve seats are kept in place by buttons. Each piston is covered by 4 light rubber valves.

The meshes in sieve beds F,' F" and in screens *b*,' *b"* must be fine enough for preventing the ore to pass through. But it is not necessary to use as many different sets of sieve beds and filtrating screens, as there are sizes of ore. Two sets answer all practical wants. Wire-gauze with very fine meshes, which has to be used, if the finest stuff is worked, should always be protected against too speedy abrasion by wrappers of coarser gauze. The frames covered with wire cloth (F,' F," *l' l"*) rest loosely upon and behind wooden strips, and are kept in position by the large frame H, which is common for all compartments in the front part of the jigger. This frame contains the ridges *c'* and *c"* and the gates *f*, *h'*, *h"*, which move in grooves; *f* is kept in position by friction only, *h'* and *h"* by wing-screws besides.

Behind frame H and sieve beds F' and F" move the piston rods in spacious grooves. The lever-heads receiving the motion from cams L must be covered with steel; the counter weights are disks of metal, kept in place by eye-bolts. By replacing one or more of those metal disks by wooden disks, and by moving them nearer to or farther from the fulcrum of lever O, it is easy to change the velocity of the rising pistons at pleasure.

* This is the position represented by Fig. III.

The Improvement of the Steam Engine and the Education of Engineers.

BY PROFESSOR THURSTON.*

Having rapidly sketched the history of the Steam Engine and of some of its most important applications, we may now take up the question:—*What is the problem, stated precisely and in its most general form, that engineers have been here attempting to solve?*

After stating the problem, we will examine the record with a view to determine in what direction the path of improvement has taken hitherto, and, so far as we may judge the future by the past, by inference, to ascertain what appears to be the proper course for the present and for the immediate future.

Still further, we will inquire, what are the conditions, physical and intellectual, which best aid our progress in perfecting the steam engine.

This most important problem may be stated in its most general, yet definite, form as follows:

To construct a machine which shall in the most perfect manner possible, convert the kinetic energy of heat into mechanical power, the heat being derived from the combustion of fuel, and steam being the receiver and the conveyer of that heat.

The problem embodies two distinct and equally important inquiries.

The first:—*What are the scientific principles involved in the problem as stated?*

The second:—*How shall a machine be constructed that shall most efficiently embody, and accord with, not only those scientific principles, but also all of those principles of engineering practice that so vitally affect the economical value of every machine?*

The one question is addressed to the man of science, the other to the engineer. They can be satisfactorily answered, even so far as our knowledge at present permits, after studying with care the scientific principles involved in the theory of the steam engine under the best light that science can afford us, and by a careful study of the various steps of improvement that have taken place and of accompanying variations of structure, analysing the effect of each change, and tracing the reasons therefor.

The theory of the steam engine is too important and too extensive a subject to be treated here in even the most concise possible manner.

I can only attempt a plain statement of the course which seems to be pointed out by science as the proper one to pursue in the endeavor to increase the economical efficiency of steam engines.

The teaching of science indicates that *success in economically deriving mechanical power from the energy of heat motion, will, in all cases, be the greater as we work between more widely separated limits of temperature, and as we more perfectly provide against losses by dissipation of heat in directions in which it is unavailable for the production of power.*

Scientific research has proved that, in all known varieties of heat engine, a large loss of effect is unavoidable from the fact that we cannot reduce the lower limit of temperature, in working, below a point which is far above the absolute zero of temperature; far above that point at which bodies have no heat motion; the point corresponding to the mean temperature of the surface of the earth is the lower limit.

The higher the temperature of the steam when it enters the steam cylinder, and the lower that at which it arrives before the exhaust occurs, the greater, science tells us, will be our success, provided we at the same time avoid waste of heat and power.

Now, looking back over the history of the steam engine, let us rapidly note the prominent improvements and the most striking changes of form, and thus endeavor to obtain some idea of the general direction in which we are to look for further advance.

Beginning with the machine of Porta, at which point we may first take up an unbroken thread, it will be remembered that we there found a single vessel performing the functions of all the parts of a modern pumping engine; it was, at once, boiler steam cylinder, and condenser, as well as both a lifting and a forcing pump.

The Marquis of Worcester divided the engine into two parts, using a separate boiler.

Savery duplicated that part of the engine of Worcester which performed the several parts of pump, steam cylinder and condenser, and added the use of water to effect rapid condensation.

Newcomen and Cowley next separated the pump from the steam engine proper, and in their engine, as in Savery's, we noticed the use of surface condensation first and subsequently that of the jet, thrown into the midst of the steam to be condensed.

Watt finally effected the crowning improvements, and completed the movemement of "differentiation" by separating the condenser from the steam cylinder. Here this movement ceased, the several important processes of the steam engine now being conducted, each in a separate vessel. The boiler furnished the steam, the cylinder derived from it mechanical power, and it was finally condensed in a separate vessel, while the power which had been obtained from it in the steam cylinder was transmitted through still other parts, to the pumps, or wherever work was to be done.

Watt, also, took the initiative in another direction. He continually increased the efficiency of the machine by improving the proportions of its parts and the character of its workmanship, thus making it possible to render available many of those improvements in detail, upon which effectiveness is so greatly dependent and which are only useful when made by a skillful workman.

Watt and his cotemporaries also commenced that movement toward higher pressures of steam and

* A paper read before the Polytechnic Association of the American Institute being the concluding portion of a lecture addressed to mechanics and engineers at the STEVENS INSTITUTE OF TECHNOLOGY February 1872.

greater expansion which has been the most striking feature noticed in the progress of steam engineering since his time.

Newcomen used steam of barely more than atmospheric pressure and raised 105,000 pounds of water one foot high with a pound of coal consumed. Smeaton raised the pressure somewhat and increased the duty considerably; Watt started with a duty double that of Newcomen and raised it to 320,000 foot-pounds per pound of coal, with steam at ten pounds pressure.

To-day, Cornish engines of the same general plan as those of Watt, but worked with forty to sixty pounds of steam and expanding three or four times, do a duty probably averaging, with the better class of engines, 600,000 foot-pounds per pound of coal. The compound pumping engine runs the figure up to about 1,000,000.

The increase in steam pressure and in expansion since WATT'S time, have been accompanied by a very great improvement in workmanship; a consequence, very largely, of the rapid increase in perfection, and in the wide range of adaptation of machine tools, by higher skill and intelligence in designing engines and boilers, by increased piston speed, greater care in obtaining dry steam, and in keeping it dry, until thrown out of the cylinder, either by steam jacketting or by superheating or both combined; and it has further been accompanied by greater attention to the important matter of providing carefully against losses by radiation and conduction of heat.

The use, finally, of the compound or double-cylinder engine for the purpose of saving some of the heat usually lost in consequence of condensation from great expansion, has already been alluded to when treating of the marine engine.

It is evident that, although there is a limit, tolerably well defined, in the scale of temperature, below which we cannot expect to pass*, a degree gained in approaching this lower limit is more renumerative than a degree gained, in the range of temperature, available by increasing temperatures*.

Hence, the attempt made by the French inventor, Dr. TREMBLY, twenty-five years ago, and by other inventors since, to utilize a larger proportion of heat by approaching more closely the lower limit, was in accordance with known scientific principles. The form of engine here referred to is known among engineers as the Binary Vapor Engine. In it the heat of the water from the condensor of the steam engine is made to evaporate some very volatile liquid, as ether or carbon-di-sulphide, which, in turn, by the expansion of its vapor, develops additional mechanical power. Mechanical difficulties have hitherto prevented the success of this form of engine, but it cannot be pronounced unlikely that coming inventors may make the system commercially valuable.

We may now summarize the result of our examination of the growth of the steam engine thus:

First. The process of improvement has been one primarily, of "differentiation"†; the number of parts has been continually increased; while the work of each part has been simplified, a separate organ being appropriated to each process in the cycle of operations.

Secondly. A kind of secondary process of differentiation has, to some extent, followed the completion of the primary one, in which secondary process one operation is conducted partly in one and partly in another portion of the machine. This is illustrated by the two cylinders of the compound engine and by the duplication noticed in the Binary Engine.

Thirdly. The direction of improvement has been marked by a continual increase of steam pressure, greater expansion, provision for obtaining dry steam, high piston speed, careful protection against loss of heat by conduction or radiation and, in marine engines, by surface condensation.

The direction which improvement seems now to be taking, and the proper direction, as indicated by an examination of the principles of science, as well as by our review of the steps already taken, would seem to be:

EN RESUME—*Working between the widest attainable Limits of Temperature.*

Steam must enter the machine at the highest possible temperature, must be protected from waste and must retain, at the moment before exhaust, the least possible amount of heat. He whose inventive genius, or mechanical skill, contributes to effect either the use of higher steam with safety and without waste, or the reduction of the temperature of discharge, confers a boon upon mankind.

In detail: In the engine, the tendency is, and may probably be expected to continue, in the near future at least, toward higher steam pressure, greater expansion in more than one cylinder, steam jacketting, superheating, a careful use of non-conducting protectors against waste, and the adoption of higher piston speeds.

In the boiler: more complete combustion without excess of air passing through the furnace, and more thorough absorption of heat from the furnace gases.

The latter, I am inclined to suppose, will be ultimately effected by the use of a mechanically produced draught, in place of the far more wasteful method of obtaining it by the expenditure of heat in the chimney.

In construction we may anticipate the use of better materials, and more careful workmanship, especially in the boiler, and much improvement in forms and proportions of details.

In management, there is a wide field for improvement, which improvement we may feel assured will rapidly take place, as it has now become well understood that great care, skill and intelligence are important essentials to the economical management of the steam engine, and that they repay, liberally, all of the expense in time and money that are requisite to secure them.

In attempting improvements, in the directions that I have indicated, it would be the height of folly to assume that we have reached a limit in any one of them, or even that we have approached a limit.

If further progress seems checked by inadequate returns for efforts made, in any case, to advance beyond present practice, it becomes the duty of the engineer to detect the cause of such hindrance, and, having found it, to remove it.

A few years ago, the movement toward the expansive working of high steam was checked by experiments, seeming to prove positive disadvantage to follow advance beyond a certain point.

A careful revisal of results, however, showed that this was true only with engines built, as was then common, in utter disregard of all the principles involved in such a use of steam, and of the precautions necessary to be taken to insure the gain, which science taught us, should follow.

The hindrances are mechanical and it is for the engineer to remove them.

We have seen that the most important problem offered the engineer for solution is a double one, and that it requires the aid of both the scientist and the mechanist in its solution.

But it is sufficiently evident that, before the engineer can determine what form of machine will best yield to him the controll of these forces of nature, he must have sufficient knowledge of science to be able to understand what scientific principles are to be rendered available and what phenomena of nature are operating in the production of the power which he is to seize upon and usefully to apply. Otherwise he will grope in the dark, and will only learn, by the bitter experience of costly failures, to make slow progress toward perfection.

We have seen that the greatest improvements effected in the steam engine were due to the united engineering skill and experience, and to the scientific attainments of JAMES WATT.

We saw that his improvements followed a long course of intelligent and scientific research, and that directed by the results of this investigation, the engineering talent and the mechanical knowledge of the great inventor, accomplished more in a single lifetime than had been previously accomplished in the whole period embraced in the history of civilization.

This great example confirms what we should infer from the nature of the problem itself, that he who would accomplish most, in the profession of the mechanical engineer, must best combine scientific attainments, especially experimental knowledge, with mechanical tastes and ability and engineering experience.

As one of our oldest engineers* tells him, he must "cultivate a knowledge of physical laws, without which eminence in the profession can never be securely attained."

He must become familiar, not only with science and the arts, but he must train himself to make the one assist the other; he must learn just how to make use of scientific principles in planning his work, and how to do his work most thoroughly, efficiently, and economically when he has determined his general design. He must be able to determine how far standard designs are in accordance with correct principles, to detect their defects and to provide a remedy correct in principle and mechanically efficient.

Science and ART must always work hand in hand.

But how is the rising generation of engineers to acquire this proficiency in both branches of knowledge? How are they to be made mentally and manually accomplished; how fitted for the great work which is before them?

The time has gone by when, in any art, the ignorant and merely dextrous workman can compete with even a less skillful shopmate, in the race for preferment, where the latter possesses and uses brains as well as hands, and knows how to make the one direct and aid the other. We, to-day, find him occupying a decided vantage ground who is, at the same time, familiar with the schools and at home in the workshop.

Whatever department in the arts a youth may be designed for, he must, to insure success in the future, be taught, not "in the school *or* the workshop," the alternative formerly offered him, but in the school *and* the workshop.

Here then arises the necessity of "Technical and Industrial Schools," in which, if properly conducted, knowledge is imparted so as not only to train the mind to habits of thought and study, to give it capacity for logical deduction, but in such a manner as shall, at the same time, make the student familiar with the principles of the art which he is to practice, and prepare him to learn the lessons taught in the workshop and the manufactory, rapidly and well.

It is the tardy recognition of this great want, this vital necessity, that has placed a great nation, which has been far in advance of all others in manufactures and the useful arts, in a position, relatively to her neighbors, that is causing the greatest uneasiness in the minds of the more intelligent of her people and of her statesmen.

They see other nations, who were formerly far behind, now rapidly overtaking her, if not already taking the lead, in consequence of the earlier adoption of a system of technical education for their people.

Two hundred years ago, Edward Somerset, the second Marquis of Worcester, the inventor, whose

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* The fact here referred to is easily seen, if it is supposed that an engine is supplied with steam at a temperature of four hundred degrees above absolute zero and works it, without waste, down to a temperature of two hundred degrees. Suppose one inventor to adopt the engine to the use of steam of a range from five hundred down to two hundred degrees, while another works his engine, with equally effective provision against losses, between the limits of four hundred and one hundred degrees—an equal range with a lower mean. The first case gives an efficiency of one-half, the second three-fifths, and the third three-fourths, the latter giving the highest effect.

† This term, though perhaps not familiar to engineers, expresses the idea perfectly.

* Charles Haswell.

work has become familiar to us, informed his fellow-countrymen of the growing necessity for such a system of education for the people, and urged the establishment of technical schools.

For this he deserves higher honor than for anything that he did for the steam engine.

But the system first took a definite form upon the continent of Europe, and, for more than a quarter of a century, it has grown with the growth and strengthened with the strength of the western European nations, until it has, to-day, become a most important element of their national power.

In our own country this great need has been long recognized, but the policy of our government does not permit it to institute systems of teaching, as has been done by those of Europe, and it has remained, to a great degree, unprovided for.

Such education cannot be provided at the small cost that the average citizen can well afford to pay, and, even if that were possible, it is quite doubtful whether the vital necessity of such an education, to the people rather than to the individual, and to the coming rather than to the present generation, would be sufficiently well understood to induce the payment of its actual cost, far below the real value, as it may be.

It becomes therefore the privilege and the duty of the wealthy among our citizens, to provide this great want of our country, and to aid, thus most effectively, in giving her that pre-eminence among nations that every patriotic citizen aspires to see her attain.

I have referred to the services rendered by John Stevens and his sons in the introduction of the locomotive and the steamboat, but no single achievement of theirs, nor all combined, has conferred so great a benefit upon the country and upon the world, as did the bequest by which one of those sons, EDWIN A. STEVENS, founded a technical school, where the youth of the present and of succeeding generations are to be taught the principles upon which is based the profession which he and his father and brothers practiced with such splendid results.

In St. Paul's Cathedral is a latin inscription which informs the visitor that a memorial is erected to its great architect, Sir Christopher Wren, but that his most appropriate monument is the great cathedral itself.

So it is here, we see no memorial erected to the founder of this first School of Mechanical Engineering, but "*si monumentum quaeris, circumspice.*"

Dry Concentration.

TO THE EDITOR: SIR—Your past uniform kindness towards me personally, and the interest you have manifested in the problem I have been laboring to work out and demonstrate for the last five years (namely, an improved method of concentrating ores), leads me to believe that you will allow me to add a few words at the close of G. W. BAKER'S series of articles on the "Systematic Preparation of Mineralized Ores by Dry Crushing and Concentration." From your editorial remarks in your issue of March 12th, I am led to believe that the position taken by Mr. BAKER, and perhaps more particularly by myself, is not quite understood, as the question is not at all met in the remarks referred to. In this connection I intend to allude only to the method of concentration, as I think the position taken on the subject of crushing or preparing the ore for concentration by Mr. BAKER and myself will not be disputed by any competent person. First, in explanation of my own position, I have to say that it has been my only aim to secure the best method of concentration without any reference to any hobby of my own. If experiments had demonstrated that by the proper application of water, a larger percentage of mineral could be saved than by air, then water, as the best concentrating agent, would have been recommended by me.

But when all the facts, and even laws, controlling concentration or separation of minerals by means of their different specific gravities, go in favor of air as the concentrating medium, then it is my duty to advocate the use of air for that purpose, regardless of educated prejudice.

I will as briefly as possible state the reasons why air is a better medium for the concentration of minerals than water, which, although simple, may be (and I think are) overlooked.

Water, in proportion to its density, will hold in suspension particles of a given size a longer time than air will, or will float them in suspension a greater distance than air (the current moving at the same speed), and, of course, particles of mineral will sink more slowly in water than in air. If, then, you increase the density of the fluid, by the addition of earth, clay, or some similar substance, to water, just in the degree to which the density of the fluid is increased, does it become unsuitable for the concentrating medium, and so on until the water becomes so foul that even large particles will not sink in it. The conclusion is, therefore, that the denser the fluid the less suitable for the concentrating medium and the more liable it is to carry off fine particles of ore.

Now, when ore is acted on by intermittent impulses of air, the effect produced is precisely the same in one respect as when acted upon by impulses of water—namely, the mass of ore is slightly lifted and loosened up, so as to allow the heavy particles to find their way to the bottom and the light to the top, and to the sense of touch the action appears the same, and, in fact, is the same. Since the particles fall more freely in air than in water, the intermittent impulses of air can safely be repeated from 450 to 500 per minute, whereas by water about 120 impulses per minute is the highest that can be safely applied, and as the quantity of ore concentrated depends on the number of lifts per minute, it can be readily calculated which will give the most rapid results.

And as water will float away larger particles, and a greater quantity of fine mineral than air will, it may be also calculated by which means we can save the greatest amount of valuable mineral.

In proof of the above, it has been shown that by my method of dry concentration the loss is less, even without any sizing, than by the German system of wet concentration with the best sizing arrangements, and with the advantages as above stated there is not a single drawback but every feature is in favor of the dry process of concentration.

As I remarked at the beginning of this letter, my object in pursuing tedious and costly experiments for the last five years or more, has been to work out the best system, and I should not have regretted if water could have been applied in some improved way so as to still have retained the mastery.

I have, moreover, felt disposed to cater to the prejudice of some by advertising to manufacture wet concentrators also, believing that many would hold to their prejudices, and would prefer to travel to Colorado by stage coach or by ox-teams, because they had been used to that mode of travel.

In earnest of my sincerity, and my belief in the system I advocate, I would offer to those who require concentration works that if my dry concentration does not secure to them much better results at much less cost than the wet process or system of concentration, they need not pay a cent for the machines.

This letter is becoming too long, and I will only add that we look to scientific journals for information, and I think a subject of so much importance to the mining industry of the country should be candidly and seriously considered.

I do not take the position that water is the best agent for concentrating ores, when it is abundant, and to recommend air only when water cannot be had; but I take the broad ground that air as the concentrating medium is superior under all circumstances, and in this view alone of the case do I invite criticism and attention. Very sincerely, S. R. KROM.
NEW YORK, March 14th, 1872.

* Lives of Boulton & Watt. By Samuel Smiles. London: John Murray. 1865—p. 13.

New Inventions.

A NEW method of making steel or wrought-iron from pig metal was described by the inventor, Dr. V. W. BLANCHARD of Bridport, Vt., at a recent meeting of the Polytechnic Association. It consists essentially in oxidizing the carbon, by blowing a heated blast of air against a thin stream of molten iron, drawn directly from the blast furnaces and allowed to fall into a cylindrical converting vessel, ten feet in height, lined with fire-brick. Only a light pressure of air would be required, and the size of the stream of metal could be regulated by a gauge. The product would be drawn off through an opening situated at the bottom of the converter. The blast would be slightly inclined upward, against the falling stream, so that the particles of iron would be kept longer in contact with the oxidizing agent. The inventor claims that by this process he can produce an article possessing the strength of wrought and hardness of cast-iron or steel.

The same gentleman also described a method of producing a durable, water tight and fire-proof roofing material by passing ordinary soft-wood shingles between toothed rollers into a bath of coal-tar heated to about 300°. The teeth of the rollers are to cut the fibres of the wood, and permit the entrance of the coal-tar. It is claimed that in this way shingles may be saturated to any desired degree. They are then placed in a dry-house and the "volatile and inflammable elements of the coal-tar evaporated from them." The shingles are afterwards surfaced or veneered.

English Inventive Genius.

According to recent English technical journals Mr. A. SPENCER, of the West Hartlepool Iron Works, has invented a rotary puddling furnace, which we judge from the description given, to be identical in principle and almost identical in operation, with DANKS' furnace, which has been in operation in this country for several years. It is astonishing to see the wonderful capacity for *invention* which is developed among the managers of English iron works, when a process has been previously discovered and tried somewhere else. It would seem unnecessary for us to attempt to instruct our English cousins of the technical press in the use of their native tongue, for perhaps they know more about it than we, but what they call *invention* we call *imitation*. If we are inaccurate in our use of the terms, we shall be happy to be corrected.

The Cooper Union Lectures.

THE course of free lectures at the Cooper Union is now in its fourth and last division. The lectures have been uniformly well attended. Prof. CHANDLER lectured, March 9, on Combustion; Mr. RAYMOND, March 16, on Time. The remaining subjects and speakers are as follows: March 23, Prof. G. W. PLYMPTON, on the Molecular Forces; March 30, A. L. HOLLEY, Esq., on the Bessemer Process; April 6, Prof. B. SILLIMAN, on the Geology and Scenery of Utah; April 13, Dr. F. A. P. BARNARD, on the Metric System. The attractiveness of the programme is self-evident.

REPORT ON THE NORTHERN PACIFIC ROAD.—The ease and regularity with which the trains of the Northern Pacific Railroad can be run over its entire length throughout the hardest winters, and its greater freedom from natural obstacles is ably illustrated in the concise report of Mr. W. R. ROBERTS, the Engineer-in-Chief of the Northern Pacific Road. The Report gives satisfactory evidence that this great highway to the Pacific will be a most successful route, and that there will be as little danger of delay in travel during the severest months of winter as there is on any of the New York or New England roads. The high character of Chief Engineer ROBERTS will stamp his report with confidence wherever it is read.

THE COAL TRADE.

Anthracite Coals.

NEW YORK, March 15, 1872.

WHOLESALE.—The demand for Anthracite Coal is, perhaps, a trifle brisker than last week, but the last cold snap causes the ice to continue to obstruct the harbors, and keep freights at about the rates we quoted last week. Any decided improvement in the demand for coal is scarcely to be expected till freights to eastern ports decline materially, and the Hudson river is opened. Notwithstanding the dullness, which has been so much complained of, we are informed by Mr. HOYT, Treasurer of the Pennsylvania Coal Company, that his company has sold their entire product for the past year, and could easily sell several hundred thousand tons more if they had them.

It has been rumored, during a few days past, that a consolidation has been effected between the Delaware, Lackawanna and Western, and the New Jersey Central railways, but the rumor has not gained general credence. Delaware, Lackawanna and Western stock advanced somewhat on the strength of the rumor, but there are some good grounds for disbelieving at present, that the union has been effected, at least until there is more definite information concerning it. Such an arrangement would be of great importance to the coal trade, but it seems useless to discuss it as long as it is so uncertain.

Freights.

Freights are unchanged, though there is but little doubt that they willl soon fall off materially,

Bituminous Coal

The canal to Georgetown is still closed with thick and solid ice, which has so far successfully resisted the efforts of steam ice-boats to open navigation. We are informed by the officers of the Consolidation Coal Company that they do not expect to receive any shipments from Georgetown before the first of the coming month. After the opening of navigation it is expected that coal will be held at the same prices at Georgetown as last year, and the price in New York will depend on the cost of freight. The demand for these coals continues good; on account of their excellent steam-generating qualities.

Anthracite Coal Trade for 1871 and 1872.

The following table exhibits the quantity of Anthracite Coa passing over the following routes of transportation for the week ending Mar. 9, 1872, compared with the week ending Mar. 11, 1871.

COMPANIES.	1871. WEEK.	1871. TOTAL.	1872. WEEK.	1872. TOTAL.
*Phila & Reading R.R†	27,564	651,848	63 219	794,604
Schuylkill Canal	....	....	....	....
Lehigh Valley R. R.	10,309	366,829	44,064	715,894
Lehigh & Sus. R. R.	1.646	65,569	34,472	240,583
Lehigh Canal	....	....	....	....
Scranton North	....	3.521	11,170	124,587
" South	....	137	35,108	367,318
Penn. Coal Co., rail	247	3,008	15.611	171,037
" " " canal	....	.....	....	....
Del. & Hud. Canal Co.	....	....	....	....
" East	....	48.332	10,531	103,599
" West	....	12,721	6,357	74,047
" South	....	....	5.493	64.052
Shamokin	12,749	81 497	9,131	68,177
Trevorton	....	....	....	....
Lykens Valley Coal Co.	....	10,046	1,359	2,580
Wyoming South	....	....	....	....
Wyoming North	....	....	....	....
P. N. Y. C. & R. R. Co.	51	34,371	10,240	131,571
Williamstown Co'y	....	17 647	....	....
Big Lick Col	89	13,313	1.920	10,591
Total	52,655	1,308,838	248,675	2,868,640
1870	....	....	52,655	1,308,838
Decrease	....	....	....	....
Increase	....	....	196,020	1,559,802

* These figures are for the week and fiscal period commencing Nov. 30

† Less coal transported for Co's use and Bituminous coal.

Bituminous Coal Trade, 1871 and 1872.

The following table exhibits the quantity of Bituminous Coal passing over the following routes of Transportation for the week ending March 9, 1872, compared with week ending March 11, 1871.

COMPANIES.	1871. Week.	1871. Year.	1872. Week.	1872. Year.
C. & O. Canal	5,410	5,410	220	220
B. & O. R. R.	26,233	132,383	19,720	180 796
H. & B. T. R. R.	7,196	49,022	5,300	52,903
*Harrisburg & D.	11,361	79.317	6,395	127,643
*L. V. R. R.	....	5.484	731	7.684
P. & N.Y.C. & R. Co.	4,421	56,150	5,444	75,476
Cumberl'd Branch Canal	....	.....	....	.....
" Railroad	....	.....	....	.....
Total	53,621	327,766	37,819	444.727
	37,819			327.766
Decrease	15,802			
Increase				116,961

The tonnage of the P. & N. Y. C & R. R. Co. is included in that of the L. V. R..R Co.

Pennsylvania Coal Company.

Shipments of Pittston Coal for the week ending March 9, 1872.

	1872. WEEK.	1872. YEAR	1871. WEEK	1871. YEAR.
By Railway	15 610 14	171,036 14	247 16	3,038 10
" Canal	....	....	....	....
Total	15,610 14	171.036 14	247 16	3,038 10
Increase 1872	.168,028 04			

Philadelphia & Reading Railroad and Branches.

COAL TONNAGE

For the Week ending Saturday, March 9, 1872.

BY RAILROAD.—ANTHRACITE.

PASSING OVER MAIN LINE AND LEB. VAL. BRANCH.

	Tons.	Cwt.
From St. Clair	20 876	01
" Port Carbon	9,142	08
" Pottsville		
" Schuylkill Haven	14,006	15
" Pine Grove	3,027	11
" Tamaqua	6,083	09
" Harrisburg		
" Dauphin	3,160	05
Total	52,296	09

FOR SHIPMENT BY CANAL.

Passing Frackville Scales	87	03
" Mill Creek "	..	
" Schuylkill Valley Scales		
" Mt. Carbon "		
" Cressona "	263	09
" Pine Grove "		
" Tamaqua "	.....	
Total	350	12

SHIPPED WESTWARD VIA NORTHERN CENTRAL RAILROAD.

Passing Locust Gap	350	16
" Shamokin	4,706	12
" Herndon	.....	
Total	5,057	08

SHIPPED WEST OR SOUTH FROM PINE GROVE.

Via Schuylkill & Susquehanna R. R.	952	05
" Lebanon & Pine Grove Branch	1 474	16
Total	1,427	01

CONSUMED ON LATERALS

From Frackville Scales	670	19
" Mill Creek "	462	07
" Schuylkill Valley Scales	328	01
" Mt. Carbon "	4•0	15
" Cressona "	318	02
" Pine Grove "	209	16
" Tamaqua "	592	18
Total	3,062	18

LEHIGH AND WYOMING COAL.

Received via Allentown, E. Penn'a br.	93	19
" " Alburtis, " "		
" " Oreland, G. & N. Br.	686	18
" " Connecting R. R.		
" " Willow Street R. R.	244	02
Tota	1,024	19

BITUMINOUS.

From Harrisburg	6,374	07
" Connecting R. R., G. & N. Br.		
" Junction R. R.	20	07
Total	6,394	14

COAL FOR COMPANY'S USE.

Anthracite	3,3 4	04
Bituminous	162	09
Total.	3,556	10

RECAPITULATION

	Total for Week.	Corres-p'g week last year.	Increase and Decrease.
Passing over Main Line and Leb. Val. Branch	52,296 09	14,647 04	i 37,669 05
For Shipment by Canal	350 12		i 350 12
Shipped Westward via Northern Central R. R.	5,057 08	9,2-2 16	d 4,165 08
Shipped West or South from Pine Grove	1,427 01	1.522 04	d 95 03
Consumed on Laterals	3.062 18	2,191 19	i 870 19
Lehigh and Wyoming Coal	1,024 19		i 1,024 19
Total Anthracite paying freig't	63,219 07	27.564 03	i 35,655 04
Bituminous	6.394 14	11,361 06	d 4,966 12
Total of all kinds paying freig't	69,614 01	38,925 09	i 30,688 12
Coal for Company's use	3.556 10	3 879 12	d 323 02
Total Tonnage for Week	73,170 11	42,805 01	i 30,365 10
Previously this year	901,925 04	737,064 00	i 164,861 04
Total to date	975,095 15	779,869 01	195,226 14

SHIPPED BY CANAL.

From Schuylkill Haven			
" Port Clinton			
Total Tonnage per Week			
Previously this year			
Total to date	13,355 16	36.225 17	d 22,870 10

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company for the week ending Saturday, March 9, 1872.

	WEEK.	SEASON.
North	43,131 18	455.477 06
South	5,493 03	64,052 05
Total 1872	48,625 01	519,529 11
Corresponding time in 1871:		
North	Suspension.	
South	"	
Total		
Increase North		
Decrease North		
Increase South		
Decrease South		
Total decrease 1872		
Total increase 1872	48,625 01	519,529 11

Statement of Coal Transported over Cumberland and Pennsylvania Railroad

During the week ending Saturday March 9, and during the year 1872, compared with the corresponding period of 1871.

WEEK.

	To C. & O. Canal. Tons.	Cwt.	To P. & O. R. R. Co Tons	Cwt.	Total. Tons.	Cwt.
1872	220	10	19,7-9	05	-19,949	15
1871	5,410	02	25,232	17	30,642	19
Increase						
Decrease	5,189	12	5.503	12	10,693	04

YEAR.

1872	2.0	10	180.795	16	181,016	06
1871	5,410	02	132,283	08	137,793	10
Increase	....		48,412	08	43,222	16
Decrease	5,189	12				

Lehigh Coal and Navigation Company,

Report of Coal transported over the Lehigh Canal and L. & S. Div. of Central Railroad of New Jersey for the week ending March 9, 1872, and for the year 1872.

	WEEK.	YEAR.
Forwarded East of Mauch Chunk by Rail	34 472	240,582
Delivered at and above do.,	1,650	11,951
Forwarded East of do., by Canal	....	....
	36,122	252,534
Corresponding period last year—		
Forwarded East of Mauch Chunk by Rail	1,646	65,568
Delivered at and above do.,	952	9,209
Forwarded East of do., by Canal	....	....
	2,598	74.778
Increase on Railroad	33,523	177,755
Decrease " "		
Increase on Canal		
Decrease " "		
Of the above there was transported on account of—		
Lehigh Coal Nav. Co.	9,103	58,662
Wilkesbarre Coal & Iron Co	21,974	143,024
	31,077	201,686
Corresponding period last year—		
Lehigh Coal Nav. Co	118	18,715
Wilkesbarre Coal & Iron Co.	1,719	37,595
	1,838	56,310
Increase	29,239	145,376
Decrease		

Report of Coal Transported over Central R.R. of N. J. (Lehigh and Susq. Div.)

Week ending March 9—Compared with same time last year.

WHERE SHIPPED FROM	WEEK 1872., tons ct	WEEK 1871. tons ct.	YEAR 1872 tons cwt.	YEAR 1871. tons.cwt.
Wyoming Region	2671? 11	2509 01	196934 07	52846 11
Upper Lehigh Region	3757 00		33945 07	4614 06
Beaver Meadow Region				
Hazleton Region	228 03	48 09	2925 06	*832 17
Mahanoy Region				
Tresckow Region	744 00		6053 03	1043 03
Mauch Chunk Region	8952 16	118 16	54173 09	17478 17
Totals	40381 10	2676 06	294011 12	76815 14
Increase	37705 04		217215 18	
Decrease				
DISTRIBUTION.				
Forwarded East of Mch Chunk by Rail	34472 05	1646 01	240582 12	65568 18
Forwarded East of Mch Chunk by Canal				
Delivered at and above Mauch Chunk	1650 00	952 11	11951 18	9209 14
L. V. R. R. at Packer'n	411 08	77 14	3097 19	2037 02
Delivered to L. & B. R. R. at Plymouth Bridge	3817 17		38399 03	
Totals				
Of the above there was transported on acc'nt of L. C. & N. Co.	9103 03	118 16	58662 10	49078 03
W.-B. C. & I. Co.	21974 16	1719 05	143024 07	143024 07
Totals	31077 19	1838 01	201686 17	192702 10
Increase	29239 18		8984 07	
Decrease				

Huntington and Broad Top R. R. Co.

For week ending March 9, 1872	5,300 tons.
Same time last year	7,196 "
Increase	1,896 "
Decrease	
Total amount shipped to date	52,908 "
Same time last year	49,022 "
Increase	3.886 "
Decrease	

Delaware and Hudson Canal Company.

The following is a statement of Coal Transported by the Delaware and Hudson Canal Co. for the week ending March 9, 1872.

	FOR THE WEEK.	FOR THE SEASON.
By Delaware and Hudson Canal,		
By Railroad, East	10.531	103,599
" " West	6,357	74,047
" " South	5,493	64,052
Total Tons	22,381	241,698
For the same period last year.		

	FOR THE WEEK	FOR THE SEASON.
By Delaware and Hudson Canal,		
By Railroad, East,		48,332
" " West		12.721
" " South		
Total Tons		61,053
Increase		180,645

Delaware Lackawanna & Western Rail Road Company.

Coal transported on the Delaware, Lackawanna and Western R. R., for week ending March 9, 1872:

	Week. Tons. Cwt.	Year. Tons. Cwt.
Shipped North	11,169 12	124,586 12
Shipped South	35,108 08	367,318 08
Total	46,278 00	491,905 00
For the corresponding time last year:		
Shipped North		
Shipped South		
Total	2,719 18	3.657 12
Increase	43,558 02	488,247 08
Decrease		

Shamokin Coal Trade.

For week ending March 9, 1872	9,1 1 13
Same time last year	12,749 08
Increase	
Decrease	3,617 10
Total amount shipped to date	6•,127 19
Same time last year	81,496 17
Increase	
Decrease	13,313 18

Penn. and N. Y. R. R.—Coxton, Pa.

Coal tonnage for week ending March 9, 1872.

	Week. Tons.	Cwt.	Total. Tons.	Cwt.
Anthracite received:				
From Lehigh Valley R. R.	7886	00	71,773	17
" Lack. & B. R.R.	578	00	19,186	05
" Pleasant Valley R. R.	896	11	26,549	00
" Sni. & Erie R. R.	880	00	14,061	07
Total	10,240	11	131,570	11
Distributed:				
To Lehigh Valley R. R.			18,115	15
To Lack. & B. R. R.	105	15	723	02
To S. Central R. R	2522	17	19,080	15
To Ithaka & A. R. R.	541	12	30,602	00
To Erie R. W. Pockets for shipm't.	5813	10	34,156	16
To individuals on line of road	536	09	9,202	13
To points at & above Carbon for use of Co.	371	01	6,910	00
To points between Waverley and Elmira	329	07	12,779	10
Total	10,240	11	131,570	11
Bituminous:				
Received from Barclay R. R.				
hipped North from Towanda	5417	14	74 669	08
Shipped South from Towanda	26	01	725	19
Northern Central R. R.			91	01
Total	5443	15	75,476	08
Distributed:				
To Erie R. R.	4939	00	64,341	07
To So. Central R. R.	478	14	10,176	06
To Ithaka & A. R. R.			21	15
To Lehigh Valley R. R.			657	08
To individuals on line of R R.			253	11
Total	5443	15	75,476	08

Report of Coal Transported over Lehigh Valley Railroad.

Report of coal tonnage for the week ending March 9, 1872, with totals to date, compared with same time last year.

WHERE SHIPPED FROM.	WEEK. Tons.	Cwt.	TOTAL Tons.	Cwt.
Total Wyoming	9 127	00	133,259	02
" Hazleton	32,680	07	465,829	08
" Upper Lehigh	11	09	783	12
" Beaver Meadow	9,443	08	172,039	14
" Mahanoy	2,974	01	52,873	04
" Mauch Chunk	77	11	867	07
Total	54,253	15	825,652	07
Same time last year	11,309	19	419,378	11
Increase	42,943	16	406,273	16
Decrease				
Forwarded East from Mauch Chunk by rail	44,064	08	715,894	06
Same time last year	10,308	16	366,829	09
Increase	33,755	12	349,064	17
Decrease				

DISTRIBUTED AS FOLLOWS.

Forwarded East from Mauch Chunk by rail	43,177	09	701,259	11
do East for use L. V. R. R.	887	08	14,634	15
Delivered at and above Mauch Chunk for use of L. V. R. R.	385	16	16,336	11
To P. & N. Y. R. R.	7,886	00	71,773	19
To N. C. R. R., at Mount Carmel			73	06
To D. H. & W. R. R.	520	01	4,773	18
To L. & S. R. R. at Packerton for rail	388	11	4,114	06
Delivered at M'h Chunk	62	05	645	15
Delivered on line of road above Mauch Chunk	446	14	7,309	16
To L. & S. R. R., at Penn Hav., for railroad			3,766	18
Do. for canal			864	07
To Lehigh Canal Mauch Chunk			99	07
Total	54,253	15	825,652	07

Prices of Coal by the Cargo.

[CORRECTED WEEKLY]

	AT NEW YORK, March 15. R. A.	W. A.	AT PHILADELPHIA, March 15. R. A.	W. A.
SCHUYLKILL.				
Lump	$— —	$— —	— —	— —
Steamer	— —	— —	— —	— —
Broken	— —	— —	— —	— —
Egg	— —	— —	— —	— —
Stove	— —	— —	— —	— —
Chestnut	— —	— —	— —	— —
Pea	— —	— —	— —	— —
LEHIGH.				
Lump, (along side)	5 00	——	— —	— —
Broken	4 75	— —	— —	— —
Egg	4 50	— —	— —	— —
Stove	5 25	— —	— —	— —
Chestnut	4 25	— —	— —	— —
Pea	— —	— —	— —	— —
SPECIAL COALS.*				
Honey Brook, Le'h W.A.	4 00@4 75		— —	— —
Spring Mountain " "	— —@—		— —	— —
Sugar Creek " "	— —@—		— —	— —
Sugar Loaf " "	— —@—		— —	— —
Old Comp'a " "	4 00@4 75		— —	— —
Room Run " "	4 00@4 75		— —	— —
McNeal " "	— —		— —	— —
Girardville " "	—		— —	— —
Hill & Harris " "	— —		3 10@4 00	—
Shamokin " "	— —		— —	— —
Lykens Valley " "	— —		— —	— —
Broad Top " "	— —		— —	— —
McMichael " "	— —		3 25@4 25	—
Henry Clay " "	— —		— —	— —
Powelton "	— —		— —	— —

Dealers in these coals may be found in our advertising columns.

Company Coals.

March, 1872.

	L.	Str.	Gra.	Eg.	Sto	Chest
*Scranton at E. Port	3 39	3 77	3 63	4 02	4 10	3 34
*Pittston at Weehawken	4 00	4 00	4 15	4 25	4 50	4 00
*Lackawana at Weehawken	3 75	3 75	3 85	3 85	4 25	3 75
Wilk'b're at Hoboken	3 75	3 75	3 85	3 85	4 25	3 75
Old Co. Lehigh at PtJohn'n	4 75	—	4 00	4 00	4 50	4 00
Lehigh at Eliz. Port	4 75	—	4 00	4 00	4 50	4 00

For freights to different points see "Freights."

*To contractors only.

Prices of Gas Coals.

March, 1872.

PROVINCIAL.

Corrected weekly by Louis J. Beltoni, Jr., 41-43 Pine st., N. Y.

Duty, $1 25, gold

	Coarse	Slack.
Block House	$1 60 @	1 75
Gowrie	1 60 @	1 75

Corrected by Bird, Perkins & Job, 86 South street.

	Coarse.	Culm of Coal.
Pictou	$2 25 @	$1 25
Sydney	2 25 @	80
Lingan	1 60 @	80
Little Glace Bay	1 60 @	1 00
Caledonia	1 60 @	80

A discount from the prices of the coarse Coal on purchase of 5000 tons and upwards. Duty $1 25 per ton, gold, on the coarse coal. 25 per cent. ad valorem on the Culm of Coal.

AMERICAN.

	Currency.
Westmoreland	$7 00 @— —
Fairmount Gas Coal Co. of N. Y.	7 00 @— —
Despard Coal Co	7 00 @— —
Penn	7 00 @— —
Newburg Orrel Gas	— — @— —
West Fairmount Gas Coal	7 00 @— —

AT PHILADELPHIA.

Powelton	$6 75

TO NEW YORK.

Provincial	
Sidney	$3 25
Lingan	3 25
Cow Bay	3 12½
Port Caledonia	3 37½
Little Glace Bay	3 25

Prices of Foreign Coals.

March, 1872.

Duty $1 25 per ton.

Corrected weekly by PARMELE BROS., No 32 Pine street, N. Y.

Liverpool Gas Caking	$ 8 00@— —
" " Cannel	12 00@13 00
" House	18 00@20 00
" Orrel	14 00@16 00

Per ton 2,240 lbs., ex-ship.

PRICES FROM YARD.

Liverpool House Orrel, screened	$16 00@17 50
" Cannel, "	20 00@25 00

Per ton 2,000 lbs. delivered

Rates of Transportation to Tide Water.

BY RAILROAD.

TO PORT RICHMOND, PHILADELPHIA.

Philadelphia and Reading Railroad, from Schuylkill Haven for consumption	$1 25
For reshipment	

MAUCH CHUNK TO ELIZABETHPORT.

L. V. Railroad from Mauch Chunk to Phillipsburgh	$0 64
C. R. R., N. J., Phillipsburgh to Elizabethport	0 95
Shipping expenses at Elizabethport	25
Wharfage	10
Total	$1 94

MAUCH CHUNK TO PORT JOHNSON.

L. V. R.R., or L. & S. R. R. from M. C. to Phillipsb'g	$0 64
C. R. R., of N. J., Phillipsburgh to Pt. Johnson	0 95
Shipping expenses	25
Wharfage	10
Total	$1 94

TO HOBOKEN.

L. V. R. R., Mauch Chunk to Phillipsburgh	64
Morris & Essex R. R. Phillipsburgh to Hoboken	0 95
Shipping expenses	25
Wharfage	10
Total	$1 94

TO SOUTH AMBOY.

L. V. R. R.	72
B. & D. R. R. / Cam. & Am. R. R.	91
Shipping Expenses	35
Total	$1 98

PENN HAVEN TO ELIZABETHPORT.

L. V. R R. Penn Haven to Phillipsburgh	0 75
C. RR. of N. J. Phillipsburgh to Elizabethport	0 95
Shipping expenses	25
Wharfage	10
Total	$ 2 05

Freights.—March, 1872.

TO EASTERN PORTS.	Cumberland. From Georgetown.	From Baltimore.	Anthracite. From Philadel'a.	From Eliz. Port, Port Johnson, and Hoboken.	From Newburg.	From Rondout.
Amesbury						
Bangor						
Bath						
Boston		3 85		2 25		
Bridgeport		3 25		1 00		
Bristol						
Derby						
Dighton						
East Cambridge		3 50				
Fall River						
Hackensack		3 25				
Hartford						
Hartford						
Jersey City		2 25		45		
Middletown						
Mystic						
New Bedford		3 50				
Newburyport		4 25				
New Haven		3 25		1 00		
New London		3 25	3 50	1 25		
Newport				1 50		
New York		2 50		50		
Norwalk				1 00		
Norwich				1 50		
Pawtucket						
Portland		4 00		2 00		
Portsmouth, N. H						
Providence		3 25		1 50		
Rockport						
Saco						
Sag Harbor						
Salem		4 00		2 25		
Stamford						
Stonington				1 45		
Taunton						
Warren						
Washington						
TO RIVER PORTS.						
Albany						
Catskill						
Cocksackie						
Coeyman's						
Cold Spring						
Fishkill						
Haverstraw						
Hudson						
New York						
Nyack						
Poughkeepsie						
Rhinebeck						
Rondout						
Saugerties						
Sing Sing						
Stuyvesant						
Tarrytown						
Troy						
West Point						
Yonkers						

MARKET REVIEW.

FOR THE WEEK ENDING MARCH 16, 1872.

IRON—There has been a little more inquiry for Scotch Pig, but as the stock is very much reduced, transactions have been confined to parcels to arrive. Foreign advices quote a further advance in prices on the other side, and holders here have again advanced their views, the market closing strong at $45 for Eglinton, $46a$47 for Glengarnock, and $48 for Coltness; sales have been made of 200 tons Eglinton at $43a$44; and 400 do. Glengarnock, $44a$45, both to arrive. At Philadelphia, 2000 tons Eglinton, on the spot and to arrive, sold at about $43. American continues in active request, and prices are again higher; we quote No. 1 $45a$47, and No. 2 $44a$45; 2000 tons No. 1 sold for season delivery on private terms. There continues a good demand for new Rails, and prices are firm at the advance noted in our last. Refined Bar from Store continues very firm at our quotations, the markets at home and abroad showing no signs of weakness—the English Mills are full of orders to next August, and our own very firm at the advanced of last week. Common Sheets from store may be quoted 6a7 cents, and Charcoal do., 7a8, the latter are quoted 6¾ for singles at Philadelphia. Russia Sheet tends upward—100 packs Sound sold at 16½ cents gold, and 100 do. Stained, on private terms.

PHILADELPHIA, March 11.—EDWARD SAMUEL reports:—Pig continues firm and advancing, with sales at highest quoted figures. In Merchant Bars, a further advance has taken place, making the Philadelphia Mill price 4.4-10 cents. The general tone of the market is exceedingly firm. We quote: American No. 1, Foundry Pig, at Furnace, $43a$44; No. 2 do., $41a$42; No. 3 Forge, $40a$41; No. 4, White and Mottled, $37a$39; Refined Bar (Mill price), $98,56; Common do., $87,50: and Rails (at Mill), $78a$80.

LEAD—Pig is quiet but steady; 50 tons spanish sold at $5,95; and 25 do. second quality, $5,87½, gold. Bar, Pipe, and Sheet are selling at previous figures.

COPPER—New Sheathing is firm at 36 cents, Bolts and Braziers 38, Bronze and Yellow Metal Sheathing 56, Bolts 28. Nearly all the stock of Ingot has now passed from speculative into Dealers' hands, and though the business is not large, prices are well sustained, and are again a little higher; the sales embrace 3,400,000 lb. Lake at 28¾a29 cents, cash, and up to April 1, 29½ being generally demanded at the close for cash lots.

STEEL is unchanged.

It is reported that the Ways and Means Committe have agreed to reduce the duty on Bessemer steel from 1¼ to 1 cent per pound, and that on steel rails from 1 cent to ¾ per pound.

SPELTER—Foreign is scarce on the spot, but there is considerable on the way. Sales have been made of 60 tons Silesian, part to arrive, mostly on private terms, but including some special brands here at 7¼a7⅞ cents, and ordinary 7 gold.

TIN—Pig continues to move pretty freely, and the advanced prices are well sustained, with still and upward tendency; the sales are 500 slabs Billiton at 37½ cents; 100 do. Malacca, 38; 500 do. Straits and Billiton, 38a39½; and 5a10 tons English, 37½, the market closing at 38½a39 cents asked for Straits, 39a38¼ for English, and 42½ for Banca, all gold. The demand for Plates continues, and with very moderate stocks of all kinds (of some descriptions a very small supply), and rising markets in England, prices are very firm at a further advance of 25 cents gold per box; sales have been made of 500 bxs, 1-3d X. Charcoal Tin at $12; 100 do., I. C. only, $12,25; 500 do. I. C. Coke, 14 by 20, $10,25: 500 do.; $10,25a$10,50; 250 do., $10,75; 500 do. to arrive, $10,37½; 1500 do. Coke Terne, $9a9,25; 650 do. Charcoal Terne, $10a$10,25, all gold; and 750 bxs. do., on private terms.

ZINC is quiet at our quotations, Am-ox 7a7½, French 8½a8¾; Sheet 10a11; Manganese 4a4½.

From a circular of Messrs BARING BROTHERS & Co., dated London, Feb. 23, 1872, we have extracted the following intelligence in reference to the Metal Market. Prices for the week have gensrally advanced with a slight improvement in the trade.

COPPER—English in more demand; Tough Cake and Ingot, £94a£96; Tile, £95; and Sheathing, £98. Foreign also in demand; Chili Bars, £83 10s.a£84 10s.; and Uramoneta Ingots, £94. A good quanity of Wallaroo has been purchased on speculation at £93a£94, with three months prompt. English Raw Copper has not been in much request, but for manufactured the demand has improved.

IRON—Steady. Weardale Steel Rails (Bessemer) £15, Plates £21, Pigs 100s. cash, W. B. Pigs 80s. cash; Tud-

hoe Bars £12, Hoops £10 10s., Nail Rods £11 10s., and Plates £14, all f. o. b. on Tyne. Welsh Rails and Bars £9 15s.a£9 5s. f. o. b. in Wales, 6 mos. Scotch Pigs 75s. 9d.a76d., cash, for mixed Nos. on Clyde.

Recent letters from Wolverhampton state that the tone of the Iron market is less firm this week, and transactions have been limited in number and extent. Quotations are, however, well supported, owing to the high rates of labor and material. Best brands of Pig made from native ore are £5 5s.a£5 10s., and cinder hematite Pigs are proportinately dear. In finished Iron an advance has been established in the price of Sheets, Singles having changed hands at £14 per ton this week. At all the Sheet mills the accumulation of orders is not very large. The aggregate yield of Iron in the district this week has been considerably diminished by the scarcity of fuel. The Iron foundries are in full production, the orders being especially large for mill and forge machinery and other engineering castings. Wrought Iron bridges, girder work, tanks and gas-holders are being largely produced both for home and foreign contracts.

LEAD—Firm and fully advanced 5s. in price. The demand for large parcels of Pigs for shipment is very extensive. Common Pig is held at £19 a£19 7s. 6d.

SPELTER—Firm at £22.

TIN—There is a better inquiry for both English and Foreign, and prices are decidedly firmer. The late operators seem to have parted with as much Tin as they care to sell for the present, and the market having been allowed to take its natural course: has hardened, and been more regular and satisfactory than for a long time past. We close strong at 146s.a147s. for Refined English, 137s.a138s. for straits, and 143s.a145s. for Banca.

TIN PLATES—The demand continues, and higher prices seen imminent. The American reports advise higher rates, and the inquiries for that quarter are unlimited. Makers as a rule are unwilling to book largely, and will only accept very full prices.

METALS.

NEW YORK, March 13, 1872.

IRON.—Duty: Bars, 1 to 1¼ cents ℔ lb; Railroad, 70 cents ℔ 100 lbs.; Boiler and Plate, 1½ cents ℔ lb; Sheet, Band, Hoop, and Scroll, 1¾ to 1¾ cents ℔ lb; Pig, $7 ℔ ton; Polished Sheet, 3 cts. ℔ lb; Galvanized 2½; Scrap Cast, $6; Scrap Wrought, $8 per ton

	Store Prices.
Pig, Scotch No. 1, ℔ ton	45 00@48 00
Pig, American, No. 1	45 00@48 00
Pig, American, No. 2	44 00@45 00
Pig, American, Forge	42 00@43 00
Bar Refined, English and American	— —@86 00
Bar Swedes, assorted sizes (gold)	85 00@100 00
	Store Prices, Cash.
Bar, Swedes	117 50@127 50
Bar, Refined, ¾ to 2 in. rd. & sq. 1 to 6 in. x ⅜ to 1 in.	100 00@— —
Bar, Refined, 1¼ to 6 by ¼ & 5:16 & 2½ to 2⅝ rnd. sq.	105 00@— —
Bar, Refined, 1 & 1⅛ by ¼ & 5:16	107 50@— —
Large Rounds	110 00@137 50
Scroll	117 50@147 50
Oval and half-round	115 00@135 00
Band	— —@112 50
Horse Shoe	112 50@122 50
Rods, ⅝ to 3-16 inch	105 00@150 00
Hoop	120 00@167 50
Nail rod	7½@— —
Sheet, Russia, as to assortment (gold)	16½@— —
Sheet, Singles, D. and T. Common	—5½@— 7
Sheet, D. an 3 T. Charcoal	—7 @— 8
Sheet, Galv'd, Nos. 10 to 27	10@13c lb.
" " Nos. 28, and 29	15@19c lb.
Rails, English (gold), ℔ ton	66 @68 00
Rails, American, at Works in Pa	75 @80 00

COPPER.—Duty: Pig, Bar, and Ingot, 5; old Copper 4 cents ℔ lb; Manufactured, 45 per cent. ad val.

	All Cash.
Copper, New Sheathing, ℔ lb	— @— 36
Copper Bolts	— @— 38
Copper Braziers, 16oz. and over	— @— 38
Copper Nails	— @— 42
Copper, Old Sheathing, &c. mixed lots	25½@— 26
Copper, Old, for chemical purposes, 14@16 oz	— @— —
Copper, American Ingot	29 @— —
Yellow Metal, New Sheathing & Bronze	— @— 26
Yellow Metal Bolts	28 @— —
Yellow Metal Nails	— @— 26

LEAD.—Duty: Pig, $2 ℔ 100 lbs.; old Lead, 1½ cents ℔ lb; Pipe and Sheet, 2¼ cents ℔ lb.

Galena, ℔ 100 lbs	$— @— —
Spanish (gold)	5 90 @6 00
German, do.	5 90 @6 00
English do.	5 95 @6 70
Bar (net)	9 25 @— —
Pipe (net)	— — @10 00
Sheet	— — @10 00

Colwell, Shaw & Willard Tin-Lined Lead Pipe 15 cts. ℔ lb.

STEEL.—Duty: Bars and ingots, valued at 7 cents ℔ lb or under, 2¼ cents; over 7 cents and not above 11, 3 cents ℔ lb; over 11 cents, 3½ cents ℔ lb, and 10 ℔ cent ad val.

	Store prices.
English Cast (2d and 1st quality) ℔ lb	— 16 @— 18
English Spring (2d and 1st quality)	— 7 @— 10
English Blister (2d and 1st quality)	— 10 @— 17
English Machinery	— 11 @— 13
English German (2d and 1st quality)	— 10½@— 12
American Blister "Black Diamond"	— — @— 12
American, Cast, Tool do.	— 15 @— 16
American, Spring, do.	— 9 @— 11
American Machinery do.	— 9 @— 10
American German, do.	— 9 @— 11

TIN.—Duty: Pig, Bars, and Blocks, 15 ℔ cent. ad val.; Plate and Sheets and Terne Plates, 25 ℔ cent.; Roofing 25. ad val.

	Gold ℔ lb.
Banca	— @42½
Straits	38¼@39
English	38⅝@39¼

PLATES.

Fair to Good Brands.	*Gold.*	*Currency.*
I. C. Charcoal, ℔ box	$11 75 @12 25	$13 25 @13 75
I.C., Coke	10 25 @10 50	11 75 @12 25
Coke Terne	9 00 @ 9 25	10 50 @11 00
Charcoal Terne	10 00 @10 50	11 50 @12 50

SPELTER—Duty: In Pigs, Bars & Plates, $1.50 p. 100 lb

Plates, foreign (gold) p. 100 lb.	7 00 @ 7 25
Plate, Domestic p. lb.	— 7 @— 11

ZINC.—Duty: Pig or Block, $1.50 per 100 lb.; Sheet 2½c per lb

Sheet per lb.	— 10 @—11

San Francisco Stock Market.

BY TELEGRAPH.

We have advices from the San Francisco Stock Market dated the 12th inst. Without exception the Market has advanced. Crown Point notably so, being quoted at $796—an advance of $90 per share compared with our last report. On the 7th inst. Belcher stood on the list at $595, a price which has been uniform with that item for some time past, as will be observed on a comparison of the following lists. Our report of to-day exhibits a regular advance over the one dated the 7th inst.

	March 12.	March 7.
Savage	222	—
Yellow Jacket	77	70½
Kentuck	237	—
Chollar Potosi	62	57½
Gould & Curry	190	175
Belcher	—	595
Crown Point	795	—
Imperial	100	97½
Eureka C. V.	16¼	16

The mining stock Board reports the Market as very dull, the sales for the week are comprised in several transfers of La Crosse, aggregating 2100 shares at the uniform price of 19c. per share, also 100 SMITH & PARMLEE at 16c. the report is as follows:

	BID.	ASKED.
American Flag	—	20
Bates & Baxter	25	—
Benton	—	5
Black Hawk	30	—
Central Gold	4	—
Casco Gold	—	—
Cons Gregory	15	—
Grass Valley	6	—
Gunnell	8	—
Holman	—	—
La Crosse	18	20
Liberty	—	3
Mariposa prf.	—	15
Rocky Mount	—	5
Quartz Hill	5	—
Smith & Parm	25	25

Petroleum is dull and unchanged, the only sale which has transpired during the week was a transfer of 100 Rynd Farm on the 11th inst. at 30c. per share, the report of the Board is as annexed.

	BID.	ASKED.
Bennehoff Run	20	—
Breevoort	1 70	2 50
Buchanan Farm	35	—
Central	50	53
New York & Allegheny	1 25	—
Northern Light	30	—
Phillips Pet	5	15
Pithole Creek	—	1 00
Rathbone Oil	20	—
Rynd Farm	25	30
Second National	—	40
United Petroleum Farms	30	—
United States	—	60

ERROR.—In the last article written by Mr. BAKER, an error occurred in the example given of concentration in Georgetown. Mr. B. was under the impression that the ore was not sized and so wrote it. When the proof was read he erased the words "without sizing," having in the meantime informed himself correctly on this point. When the proof was corrected this change escaped the attention of the compositor, so that the words appear as first written. The ore was sized in the Washington mill. B.

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Polytechnic Association of the American Institute.

Meeting held March 1, 1872, President TILLMAN in the chair.

CUTTING IRREGULAR FORMS.

DR. VIRGIL W. BLANCHARD, of Bridport, Vermont, explained his machine for cutting irregular forms automatically in wood, iron or stone, and exhibited a sample of the work in stone. The principle is essentially the same as that of the Blanchard lathe. The difficulty in cutting in stone hitherto has been two-fold; First, to produce a pattern that the tracing-bar will run upon rapidly; and second, to preserve the sharpness of the cutting point. This machine produces from the model a pattern which is almost a plane surface, and then transposing the tracing and the cutting points, from that pattern a perfect facsimile of the model may be produced. He read the following description of the machine, written by J. E. EMERSON. the inventor of the movable tooth-saw:

For the past fifty years many attempts have been made to devise mechanism to automatically produce the irregular forms found in carving, sculpture, bronze, &c., but which have till now signally failed. This lathe, or engine, to which any amount of motive power may be applied that may be requisite, that will automatically produce any of the irregular forms found in carving, sculpture, bronze work and engraving—that will produce every line and feature with mathematical precision and certainty—that will work equally well upon wood, stone or metal, that is simple in construction and easy to manipulate, has long been wanted to meet a great and growing demand in the field of the fine arts.

Every want seems to be fully realized in this invention to which reference is made. The difficulties to be met in the solution of this mechanical problem that is solved in this invention are fivefold in character.

First, to devise a pattern of such a character so near a plane that an anti-friction ball will roll rapidly upon its surface, and yet have *such* a pattern produce the irregular form desired.

Second, to have the cutting point so sensitive to the motions of the tracing ball upon the pattern as to produce with mathematical certainty and precision every line and feature found upon the surface of the pattern, in the material wrought, and yet, in the presence of all this delicacy and sensitiveness in action, to be able to apply any desired amount of force or motive power to the cutting point.

Third, to be able to transfer the design of the same pattern to any variety of form in the material wrought, whether an oval, cylindrical or plane surface, or any other that may be desired.

Fourth, to adapt the mechanism of the machine to the production of the pattern from the original work of art.

Fifth, to combine the solution of the above four mathematical problems in a simple, durable, practical form, the machine as a whole being perfectly *automatic* in its action.

In the practical operation of this invention the work of art, whatever it may be, whether a bust, or sculptured vase, or an ordinary piece of carving is placed in the machine, a piece of wood of the requisite size is at the same time placed in the proper position in the machine from which the pattern for future use is to be cut.

The machine on being put in motion from the work of art, whatever it may be, will produce a pattern in the wood from which a duplicate of the work of art may be produced. A metal cast of the pattern after being produced in the manner described, on an almost plain surface, is then taken, filling in this invention the place of the stereotype plate in the art of printing.

The metal cast of the pattern being put into a proper position in the machine, and a suitable form of wood, stone or metal being placed in the position occupied by the work of art during the process of cutting the pattern, as above described, the machine with a suitable cutting point and requisite amount of motive power, will *automatically* produce the work of art, whatever it may be, with a rapidity in proportion to motive power applied.

The principles involved in this invention and in their application are entirely novel in the field of mechanical art. As a combination of intricate and delicate action, with the great strain resulting from the application of a large amount of motive power, yet with all the delicacy and sensitiveness preserved and applied in the midst of high velocities and ponderous effect, with a mathematical precision that is beyond criticism, this invention is truly a crowning and as yet the grandest triumph in pure dynamic science.

As illustrative of this point, we would observe that to the cutting point, where a delicacy and sensitiveness in action is required that will produce the most delicate lines and features found in an elaborate piece of statuary, in the machine which I recently saw in operation, from one to four-horse power as a motive agency could be applied.

As a piece of automatic machinery in simplicity, and general adaptation to the end desired, competent judges pronounce this invention to be unrivalled.

On visiting the doctor's pleasant house, there, on the mantle-shelf in his parlor, sat a bust of WEBSTER, just as it came from the machine, every feature perfect, and the life-like expression of the lion face never excelled by any artist. Surely will mechanism compel the sculptor to lay down his chisel.

Dr. B. proceeded to explain the cutting point. It has been hitherto supposed that a slow motion is required. On the contrary, it is found that when revolving 40 or 50 revolutions per second, its cutting property will be destroyed; but revolving from 70 to 80 revolutions per second, it will last indefinitely. Fine steel may be made to retain its sharpness in the presence of quartz.

The PRESIDENT—The principle involved is the same as in the Tilghman Sand Blast, that a soft substance in rapid motion will cut a much harder substance. Some years ago a wooden vessel, the Swallow, ran directly through one of our stone piers; and I learn from Dr. BLANCHARD, to whom I stated this to-day, that it was one of the facts which led him to make his discovery.

Dr. BLANCHARD—It was the great fact.

The PRESIDENT—On the same principle a disk of copper may be revolved so rapidly as to cut the hardest steel. The essential improvements in this machine, over the lathe of THOMAS BLANCHARD (of whom he is a distant relative), is that the tool has a rapid rotation.

Dr. VAN DER WEYDE—If the pier had been in motion and the vessel still, the result would have been the same. When the disk of copper cuts the steel, it is not by its velocity, but because a great many particles of copper come to act upon the same point. But in the case of the vessel coming in contact with the pier, motion and rest being only relative, it makes no difference which was in motion.

The PRESIDENT—You can shoot a tallow candle through a pine board.

Dr. VAN DER WEYDE—For the same reason that a great many particles follow each other, to increase the effect produced by the first.

Mr. BULL described a similar machine which he had constructed in 1866. The tool revolved 8,000 times per minute. All the works revolved on steel points; there being 32 steel points, connected with two sets of parallel levers. It required to be guided by the thumb and finger in tracing, and was used for cutting madallions, eight inches in diameter.

Dr. VAN DER WEYDE stated that a similar machine was used for making wood type, cutting the forms of the letters, but not producing relief as in other machines.

Dr. BLANCHARD—My machine does not require skilled labor; it is automatic. Ten or twelve cutting points can be applied at once. With two points it will cut in marble ten superficial feet, two inches deep, in ten hours, using four-horse power. A cylindrical surface may be cut with equal facility.

Mr. KELLY stated that the work done with Mr. BULL's machine was more delicate than the sample produced.

Dr. BLANCHARD explained that the sample was cut in a very soft stone, and was not intended to show the capability of the machine in cutting a fine stone.

Mr. PORTER added the explanation that the pattern itself in this case was of wood, and not delicately finished.

Mr. FISHER suggested that the principle of giving drills a high speed might be applied to great advantage in tunneling.

Dr. RICHARDS suggested the use of this machine for forming spectacle lenses.

Mr. RAYNOR stated that in slitting the iridium points of gold pens, 18,000 revolutions per minute are used.

Dr. BLANCHARD (in reply to Mr. FISHER) stated that his machine would either enlarge or diminish the size, if desired.

The PRESIDENT remarked that this was a peculiarly American invention, and narrated the manner in which the original Blanchard lathe came to be invented.

Dr. BLANCHARD then read a paper on roofing, and on a new method of manufacturing steel, abstracts of which will be found elsewhere.

The PRESIDENT—One peculiarity of this process is that you can graduate the amount of air so as to produce pure steel or any gradation. BESSEMER has to use about 20 lbs. pressure to the square inch in his blast. The result is that the air passes up through in channels, and only about a thousandth part of the oxygen is utilized. In the new process all the oxygen is utilized. Another peculiarity is that this apparatus can be applied readily to any ordinary furnace.

Mr. ROOT—What will be the additional expense of the casting?

Dr. BLANCHARD—Merely the loss of 2½ per cent. of carbon.

The PRESIDENT—The oxygen of the air not only unites with the carbon, but with the iron; and there is the great point to be settled with regard to the economy of this process, how much iron is burned up and reduced to oxide? In the BESSEMER process about 10 per cent. of the iron is supposed to be consumed.

Dr. BLANCHARD further stated that the air blast has a pressure of 4 lbs. to the square inch, and is heated to about 600 deg. He proposed hereafter to try the effect of chlorine gas in the blast, to eliminate the phosphorus.

THE STEAM ENGINE.

Prof. R. H. THURSTON read a paper on the improvement of the steam engine, which will be found in another column.

The PRESIDENT—I wish again to call attention to the fact, which I stated last week, that WATT had nothing whatever to do with the invention of the American steam engine, which is the high-pressure engine, an engine producing power by heat, and not by heat and cold. The English books are full of accounts of English engineering, with little relating to America; and yet all the English engineering projects together do not equal those in the State of New York alone. Along the line of the Erie Canal, there are greater wonders of engineering than in all Europe. They know perfectly well that we have had more experience in hydraulic engineering. You may be aware that Mr. MCALPINE, who is recognized as one of the first engineers of the world, has recently been called to examine the river Danube and make it navigable. But American skill is not yet recognized in the books. I am willing to give to Europeans all the credit they deserve; but as Americans, we should not forget that OLIVER EVANS invented the steam engine.

Prof. THURSTON—I am afraid that your remarks put me in the position of having forgotten to give credit to our own country; but in my first lecture at the Stevens Institute I had fully described the work of OLIVER EVANS; in the lecture of which I have read a part to-night, I merely summarized the inventions to show that the steam engine is not one invention, but a growth or accretion of inventions.

The PRESIDENT—Every flouring mill or an elevator, in our country is a monument to the genius of OLIVER EVANS; and yet, in Dr. HAWKES' "American Biography," his life is put in one line.

Mr. J. K. FISHER—The high pressure engine was appreciated by WATT, but his workmen could not make boilers steam tight. It was the want of good workmanship that kept back the steam engine. In 1820 even, it was very difficult to get a tight boiler. If we have adopted the high pressure principle earlier than England, it is because we are more fool-hardy. We were led into it probably from the fact that we began our engineering about the time when boilers could be made to bear a high pressure without leaking.

THE ENGINEERING AND MINING JOURNAL.

ROSSITER W. RAYMOND, Ph. D.,
WILLARD P. WARD, M. E.
Editors.

PUBLISHERS' ANNOUNCEMENT.

THE ENGINEERING AND MINING JOURNAL *is projected in the intent of furthering the best interests of the Engineering and Mining public, by giving wide circulation to original special contributions from the pens of the ablest men in the professions. The careful illustration of new machinery and engineering structures, together with a summary of mining news and market reports, will form a prominent feature of the publication.* It is the Organ of the American Institute of Mining Engineers, and is regularly received and read *by all the members and associates* of that large and powerful society, *the only one of the kind in this country.* It is therefore the best medium for advertising all kinds of machinery, tools and materials used by engineers or their employees.

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The Postage on THE ENGINEERING AND MINING JOURNAL *is twenty cents a year, payable quarterly in advance, at the office where received.*

THE SCIENTIFIC PUBLISHING CO.
WILLARD P. WARD, MANAGER,
37 Park Row,
P. O. Box 4404. NEW YORK CITY.

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THE publication of the lecture of Prof. THURSTON on the steam engine prevents us from giving this week any papers of the American Institute of Mining Engineers, except the conclusion of that of Mr. DADDOW. We shall make up for the delay next week.

Oppression by Law.

THE Legislature of Montana is reported to have passed a bill, prohibiting aliens from acquiring or maintaining any titles. Whether this sort of law is constitutional or not, it is certainly destructive of the interests of the community, as may be shown in numerous instances where the Chinese have purchased, for cash, claims which white men could no longer afford to work, and have proceeded to make them productive, at a smaller profit to themselves, than to the Territory. Besides being bad policy, this course towards the Chinese is rank dishonesty. The men who were glad enough to sell their old and worn-out diggings to these patient and frugal strangers join in the cry, that the Chinese will overrun the land, and propose to eject them from the property they have paid for. As it seems to us, there is no harm to society in that kind of usurpation of soil, which consists in buying it and paying for it; and, at all events, those who, by virtue of laws of their own manufacture, excluding foreigners from rights of original location, get the land in the beginning for nothing, and then, after having skimmed it of its richest treasure, sell it at their own price, and pocket the money of the purchaser, are no better than highway robbers if they conspire thereafter against the title they have transferred.

We must candidly say, however, that while the legislation of Montana is outrageous, and there is a great deal of silly and wicked talk of the same tone among certain classes of the population, we have heard of only two or three cases of actually perpetrated injustice. Practically the Chinese have not been persecuted with violence nor directly robbed, except in a few instances. But there is certainly danger, under the recent law we have mentioned, that they will suffer serious wrong. It is indeed a ludicrous illustration of human stupidity—a Territory full of whites, every man of whom owns mining ground which he is anxious to sell, deliberately destroying their own market by excluding all the purchasers of second-class ground. In every enlightened community, the producer takes pains to find consumers for his refuse and otherwise worthless material; in Montana 3000 men, whose ambition is to save money and buy cast-off claims—the refuse of wasteful white mining—are considered as interlopers, and kicked out of doors.

One thought is calculated, however, to provoke anger rather than laughter, namely, that the ignorant and narrow-minded authors of this folly themselves have no rights to the mines except such as the United States has generously granted them, in consideration of the benefit to the whole country from the proper development of its resources. They are wasting the bounty of the people and attempting to exclude from its benefits those who would economically utilize what they squander.

In the interest of public policy and common justice we say to these smart statesmen, that if they deny the Chinese the ordinary rights of person and property, it will be necessary to grant that race the rights of citizenship, that it may protect itself, and do its part in the industrial development of the country.

The Centennial Celebration.

THE Commissioners from the different States and Territories for the Centennial Celebration of American Independence in 1876, at Philadelphia, have held a preliminary Convention in that city, to effect an organization and appoint committees. General J. R. HAWLEY, of Connecticut, was elected President of the Commission. Committees were appointed on Foreign Affairs, Legislation, Plans and Architecture, Opening Services, Finance, Tariff and Transportation, and an Executive Committee. An interesting address was delivered by Commissioner W. P. BLAKE, of Connecticut, on the objects, plans, general success and defects of the New York World's Fair in 1853, and the Paris Exposition in 1867. We quote a few sentences referring to the department of mineral resources. Of the New York Exhibition, Mr. BLAKE says:

"In the mineral department, for example, it was found that although we might print circulars and applications in blank by thousands, and spread them broadcast through the mails, reaching the mining districts and metallurgical establishments, the responses were few and scanty. The producers of raw materials have no special pecuniary inducement to exhibit. It is rare that they appreciate their duty to the industrial arts and to the public in great exhibitions. It was, therefore, necessary in the case of the New York Exhibition, as in all exhibitions, to make special and direct efforts by competent persons in order to secure a proper representation in those directions.

"In the Paris Exposition the display of raw and unmanufactured products was superb, and was so chiefly because the production of these raw materials, which underlie the industrial development of a nation, is under the special care and patronage of the governments. Through the well-organized Departments of Agriculture, of Mining, and of Forestry in France, Belgium, Prussia, Austria, and other countries, very complete and effective displays were secured outside of the special contributions of great establishments. And here allow me to say that we may rightfully expect much from the intelligent co-operation of our own Department of Agriculture, and from State agricultural societies. But our mines receive little special care or patronage from the Government. The magnificent mineral domain of the United States is left to take care of itself. So of our forests. In these important departments, of which, in a young country like ours, other nations expect of right to see a very prominent display, we were deficient in 1853, and without care will be so again."

We hope this wise suggestion will be heeded. One result of Mr. BLAKE's address was the appointment of a Committee on Classification, of which he is chairman. Another result ought to be the creation of a special agency to secure a complete representation of the mineral products of the country.

Greenwell's Mine Engineering.*

The want of a complete hand-book, in the English language, on the subject of mining engineering is at least in part supplied by Mr. GREENWELL's work, which is devoted to the operations undertaken in the working of beds of coal and iron ore. The first edition of the work appeared in 1852, and was based upon a series of lectures delivered by the author at the Newcastle, England, College of Practical Science. Since that time many changes and improvements have been made in the methods of working mines, and vast additions have been made to the literature of the subject, all of which could not possibly be incorporated in the new edition of the work on engineering. We believe, however, that we are very moderate when we say that a large amount of new matter has been introduced. A large portion of the voluminous proceedings of engineering societies treats of the minor details which could not possibly be included in a general treatise on the subject of mining.

The volume now before us is a quarto, containing two hundred and fifty pages of letter-press and sixty-four double page lithographic illustrations of fossils, machinery and of working mines and stratigraphic sections.

The first chapter treats of the applications of geology to mining, and contains a great deal of matter more valuable to the engineer practicing his profession in England than to one whose field is in this country. Still a knowledge of the geology of the English coal fields would, in many cases, enable the coal miner to take advantage of indications which he might otherwise fail to observe. The geology of the French, Belgian and American coal-fields is also alluded to, and the order in which the strata lie is given.

The next chapter treats of building materials, and contains remarks on the making of brick, lime and cement, and the characteristics of good building materials of various kinds, including fire-bricks. The third chapter treats of dikes, slips, faults, etc., and contains a number of tables regarding the internal heat of the earth as shown by experiments in deep shafts. The remarks on the preliminary examination of mineral properties and the exploring of coal-beds by boring, in the succeeding chapter, is well worth perusal. It gives short descriptions of

* A practical treatise on Mine Engineering, by G. C. GREENWELL, F. G. S., M. Inst. C. E., etc., Colliery Viewer. Second Edition. E and F. A. SPON, London and 446 Broome street New York. Price $21.00.

many different methods of boring, together with figures, practical details and remarks on timbering (cuvelage) tubbingdams, etc.

The following chapters treat of the strength of materials, ropes, etc., underground haulage, working coal by machinery, ventilation, safety-lamps, accidents, etc.

It must be borne in mind that no book on mining can possibly embrace all that a mining engineer should know. The most that can be expected of it is that it should give the general outline which every engineer must perfect and enlarge upon by his own experience.

The engravings to which allusion has already been made, are well calculated to illustrate the objects which they represent and to give practical assistance in the construction of machines, the carrying out in practice of the various plans of working, the proper position of timbers, etc.

The book was intended by the author to be practical in its scope, and if it contains less theory than some other books of its kind, it possesses the merit of containing a large number of practical working results, which are generally more valuable than volumes of theoretical reasoning and arguments.

About-Town Jottings.

BUSINESS AND PERSONAL.

Attention is called to the advertisement of DANA & COMPANY, formerly DANAS & LITCHFIELD, 18 William street, on our outside page.

Personal announcements and business notices, inserted in this column, at fifty cents per line.

Geo. F. Blake & Co., 79 Liberty street, Steam Pumps of every size and capacity, for all purposes.

Utica Steam Engine Co. (formerly Wood & Mann Steam Engine Co.,) 42 Cortlandt street, N. Y.

Post & Goddard have removed to No. 111 Liberty street. Dealers in Taps, Dies, Reamers, Drills and supplies generally.

Peteler Portable R. R. Tracks and Cars. Miners and contractors, send for circulars, 42 Broadway, N. Y.

American Submerged Pump. Power attachment—cheapest and best in the market, 55 Chambers street, N. Y.

Roper Caloric or Hot Air Engine, 124 Chambers St.

Blake Bros., New Haven, Conn., manufacture Stone Breaker for crushing ores and minerals of every kind into small fragments, preparatory to their further comminution by other machinery.

Pillars of Coal.*

By S. HARRIES DADDOW.

(CONCLUDED FROM PAGE 163.)

SUBSTITUTE FOR PILLARS OF COAL.

WHETHER the long wall, board and wall, or any other system of mining be employed, which is based on the principle of extracting all the coal, a substitute is necessary and always provided, to take the place of the coal extracted, and provide that protection to the surface, and security to the miner and mine now vainly sought for, or attempted by our miners at the sacrifice of half our resources of anthracite.

Of course, props or pillars of masonry would be too expensive for use, and could only afford temporary and partial security at best. Fortunately, they are not required, because the coal is *permanently* replaced by a substantial stratum of rock. As fast as the coal is extracted, its place is occupied by the overlying roof slates which break and fall soon after the coal on which they rested is removed.

We know that all our workable coal-beds are accompanied by an overlying stratum of slate, shale, or comparatively soft material—except in a few localities where the "roof-slates" have been displaced, and the heavy rocky strata rest on the coal.

These "roof slates" are of variable consistency, but never in a massive stratum. They are always stratified in their beds—sometimes tough and elastic in fracture, but generally brittle and easily broken, and frequently friable and crumbling.

To keep these roof slates from falling is the main object of pillars between our chambers, as now used; consequently, a "good top," or strong roof slate is a desirable quality in a coal bed, when mined by the pillar method.

But, by the other methods, which we will term panel, for convenience, where pillars are not used, the quality of the roof is of much less importance.

Indeed, a very strong roof is much more objectionable than a very weak one, because, in the panel method it is desirable that the roof slates shall fall soon after the coal is removed; but, should the top fall immediately, the coal can be obtained with greater security to the miner than would be possible by the pillar mode, as we will show in another connection.

The panel method, in this respect, is the *reverse* of the pillar method, because in the latter the effort is directed to keep up the roof slates; but, by the former, the effort and design is to bring them down in a broken condition in order to pack or fill the place of the coal as early as possible. We can calculate closely how much broken strata would be required for this purpose, when the thickness of the coal removed, and about the average dimensions of the broken pieces of slate are given. Thus, a coal bed 10 feet in thickness, might require 15 or 20 feet of overlying strata to fill the space of both; and, a stratum of 25 to 30 feet of broken rock, would consequently become a substitute for the coal, and a solid permanent pillar. Thus, this simple substitution of the broken roof slates, by the most easy and natural process, becomes the most acceptable and available pillar that could be desired or suggested. It affords permanent protection to the surface, and permanence to the mine, while it also provides the greatest security to the miner. It enables the miner to obtain all the coal, saves the expense of timber, and otherwise reduces the cost of mining; while ample facilities are also provided for the rejection of the impurities of the coal bed, because they can always be thrown among the broken roof slates, and thus left in the mine, instead of being loaded in the mine cars, paid for at the rate of pure coal, broken into a hundred small pieces in the breaker, and thus picked out at great expense, or sold to consumers.

It was stated in the beginning of this paper that it is possible for the mining engineer to calculate how near the surface a coal bed may be safely mined by this process, when the dimensions of the coal bed, and the character of the overlying strata are known. It is not necessary that we should further explain how these data may be obtained or made available; because it must be clear to the mind of any practical man, that the breaking process would be arrested at some ascertainable limit. The broken strata could not be packed again in their original dimensions. Falling promiscuously, they would naturally occupy one third more space than they required when *in situ*. The actual increase in bulk would depend, to a considerable extent, on the character of these roof slates or overlying strata, and the manner in which they would break, fall and pack; but, in the same bed, and the same method of mining, there would not be much variation in the form of breakage or the limit at which it would be arrested; consequently, the data to make the calculation, would be available in all classes of coal beds. Over the 30 feet Mammoth vein the breakage would be arrested within 80 or 90 feet, or generally below the Mahoning or Mammoth sandstone. Any depression of surface below that would be gradual, and not dangerous, except beneath heavy buildings or streams of water.

The character of the slates overlying the Mammoth is favorable to this sort of mining, because the slaty stratum is generally more than double the thickness of the coal, while the great sandstone above this stratum is so massive that it will settle down, if it moves at all, gradually, preserving the overlying coal beds from injury.

WORKING DOUBLE BEDS.

Double beds are of frequent occurrence in many localities within the anthracite fields, owing principally to the habits of coal beds B and E, which frequently divide, forming two or three beds each; but there are other beds, also, which are sometimes close together, and yet too far apart to be mined as a single bed.

To illustrate such cases one example may be sufficient, and we select the Mammoth and "seven feet," at St. Clare, which are there divided by from 5 to 20 feet of slate, as an instance, perhaps of the greatest difficulty in the present methods.

If the upper bed is mined first, by our present or pillar method, and the weight of the roofs drawn on the pillars, it becomes exceedingly difficult to work the Mammoth, which may be from 5 to 20 or even 30 feet below, because, while an increased pressure is induced in limited localities, this pressure is, moreover, concentrated on the pillars, whose bases may rest either partially or wholly on the roof slates of the mammoth chambers below; and when this happens, as it frequently does, in spite of the care supposed to be taken, in locating one pillar directly under the other, but little coal can be obtained from such chambers. The best that can be done is to abandon them and open other chambers, directly under the corresponding chambers above. We have noticed cases of this kind in other regions, and in one particular instance, where a new colliery, or set of workings had been opened beneath an abandoned mine to which there was no access, and consequently no means of locating the chambers and pillars of the bed, which was 20 feet below. The result proved that it was impossible to mine the lower chambers, unless they were squarely located beneath those above, and this proved a most difficult matter, because the old works were extremely irregular.

There is no difficulty, however, in the panel method, because the upper bed, may be mined in advance any length of time, provided only that the dividing strata are of sufficient thickness to fill the place of the lower bed on the principle set forth, without breaking through to the bed above. In fact, on this principle it would be possible, and indeed practicable, to mine the extreme local enlargement of the Mammoth, where this great bed is often 40 to 60 feet in thickness, and in a few cases, nearly 100 feet thick!

Twenty feet of the top may be mined, and the roof let down on the remaining coal which may be subsequently mined from beneath the broken slates, which would not be so difficult as it may appear. This method, however, is not new, because it has been successfully and satisfactorily practiced elsewhere, as, doubtless, many of our mining engineers are aware.

METHOD.

We do not intend to enter into the details of mining by the Panel method, because that would involve the discussions of longwall, board and wall, the DUDLEY "ten yard" special mode, the BLANZY, and perhaps a few others, which have proved successful and advantageous in coping with local peculiarities. But, whatever mode is now adopted by practical mining engineers in older mining communities, *all the coal* must be extracted, and no system is perfect that does not admit of this consummation.

It may be noted that the British commissioners, appointed to investigate the duration of their coal fields, estimated only 10 per cent. as the probable loss. We may be permitted, however, to give an opinion, regarding the most suitable methods for mining our deep coals. The surface coal in the anthracite regions is nearly all exhausted or abandoned, a far greater amount being abandoned or lost, than has been vended. Consequently, the deep coals concern us most, and to develop them the skill of the engineer is absolutely necessary to ensure success.

We have used several methods in our own experience, and have had the opportunity of studying and investigating both long-wall and board and wall,

* A paper read at the Philadelphia meeting of the American Institute of Mining Engineers.

personally, in the mines ; and while we have had no practical experience in the DUDLEY method, our acquaintance with intelligent miners who have worked in the Dudley and Staffordshire "thick coal," enables us to speak intelligently in regard to these various methods.

BOARD AND WALL.

For most, if not all of our bituminous coal beds, and the horizontal or slightly inclining beds of the anthracite region, the board and wall, as originated by JOHN BUDDLE, could be used with great advantage over our present method of pillars, and by this mode all or most of the coal can be obtained. This method may be properly termed right-angled long-wall, or even right-angled panels, because it differs from long-wall chiefly in the fact that the long-walls (board and wall), are parallel with the dip, instead of the strike. The only disadvantages in comparison with long wall, *per se*, being that the pillars below the lower level must be heavy and partially lost ; while in long wall, as most extensively used, these pillars may be extracted with the coal above them.

But the advantages of a larger production, and the gain of time in opening the mine to its full capacity, would fully compensate for this loss. This method, however, cannot be recommended, where the dip is too great to admit the use of horses or mules, in conveying the coal from the chambers. But by this system, or by the long-wall system, the capacity of a colliery is limited. A shaft may develop a body of coal 500 yards on the dip, and yet the production would be limited to the number of "walls," or levels which might be operated at right-angles to the gangway (lower level), in one case, and parallel with it in the other.

This right angle method, however, is the simplest possible departure from our present pillar system. The only material change necessary, is the contraction of our breasts or chambers to some absolutely safe dimension, merely as the means of approach and for the conveyance of coal, if it would not be entirely safe to increase this area ; but this decrease in the size of the breast is proportionably made up, by the increased size of the pillar. By the old method of breast all the coal is obtained in advancing while the pillars are lost, but by this method little coal is obtained in driving up, yet all the coal is obtained in withdrawing, and no pillars are left.

BOARD AND PILLAR.

We stated that pillar and panel systems are the reverse of each other, and it might be inferred that pillars are dispensed with in this method, but the reverse is also true, because by this mode the *whole coal* is left as a pillar, except the small opening, through which the miner approaches—where he is sure of security and a safe retreat—which provides ventilation and through which the coal is conveyed. The industry of the miner is carried on through the solid coal, or galleries through the panel or long-wall systems, while the breast and pillar mode requires all this to be done through the excavated parts, between pillars which are always reduced to their smallest possible dimensions, and under the hanging roof, supported by decaying props.

There are, therefore, two radical and material improvements in the panel over the pillar mode. The first substitutes the roof-slates for pillars in the abandoned mine, thus turning a difficulty to an advantage—coaxing them to fall instead of trying to prop them up, with whole forests of timber, and at the sacrifice of half our resources in coal—which, at fifty cents per ton, (its worth in improved collieries), would pay our National debt, thrice told. !

The second substitutes almost the whole coal for pillars in the industrial departments of the miner.

In regard to the board and pillar *per se*, we shall have little to say. It differs chiefly from board and wall and long-wall in dividing the "walls," into pillars and the entire mine into panels. It seems to have all the advantages of the other methods and none of their disadvantages. It is, however not so applicable to beds of great inclination as the long-wall, and for this reason we have advocated a combination of both long-wall and board and pillar, and in our large beds the "10 yard" method, slightly modified to meet this combination. For the sake of convenience, or for want of a better term we propose to call this method long-wall-panel.

This is designed for all angles of dip, but chiefly with reference to our large, inclining beds, great depths and large collieries.

The design is to operate from two to four levels (though more may be used) from the same shaft or slope. Sweeping out the upper levels in advancing on the long-wall principle, and the coal of the lower levels in returning on the same plan.

Thus, while a large production may be realized from the start in the upper levels, or lifts, the lower ones are being opened and ready for withdrawing when those above are worked out.

In order to use this method two levels are necessary ; more may be used, however, if needed. The upper one is abandoned however, as fast as the coal is exhausted, while the coal is conveyed through the whole coal of the lower level to the gangway, and the air courses in the same direction to the return air-way, below the gangway. There are, consequently, always provided, permanent avenues of approach and transit, until the entire body of coal is exhausted, whatever may be its length or breadth. No pillars need be left or coal wasted.

RATIO OF DANGER AND PRODUCTION.

The figures are not available at this time to make a relative comparison between chief mining districts of the world in regard to the production per capita per annum, or the ratio of danger, nor have we the space for such a purpose, but in order to contrast pillar and panel we will cite a few prominent cases, which we think, exhibit a fair comparison.

TABLE FOR THREE YEARS, ENDING 1869,

Showing the number of deaths, amount of coal in tons, mined per death from all causes ; ratio of safety—100 being most safe—and number of tons mined per capita per annum.

LOCALITIES.	Systems	No of D.	Tons per Death.	Safety R.	Tons per Capita "Annum.
North Durham & Cumberland	Panel.	249	133 310	80	387
South Durham	Panel.	279	163 698	88	
South Wales	Pillar.	533	51 536	30	310
Manchester District (chiefly)	L'ng wall	218	94 821	56	271
Schuylkill, Pa., (one year) 1870	Pillar.	112	38.000	25	250*
West Scotland	Panel &	126	153.475	92	285
East Scotland	L'ng wall	136	166.321	100	291
Yorkshire.....(chiefly)	Pillar.	59	48 746	29	262

* Approximated as the highest figure. The ratio for the Schuylkill Anthracite regions this year is rather more favorable

American Institute of Mining Engineers.

OFFICIAL BULLETIN.

Announcements to Members and Associates.

I. It is believed that several names of members and associates elected at the Bethlehem meeting in August, 1871, have been accidently omitted by reason of the loss of a portion of the records of that meeting. Such persons, or their friends, are requested to communicate with the Secretary.

II. All members and associates who have not paid their dues are requested to do so at once. by sending in postal orders, or check, or money, ten dollars to the Secretary.

All members and associates who pay their dues for each current year, strictly in advance, will have sent to their address, regularly and weekly, the ENGINEERING AND MINING JOURNAL, which is the organ of the Institute, and will contain the proceedings and transactions, and all important papers read before the Institute, and all notices of meetings. Back numbers cannot, as a general rule, be sent.

III. It is expected that the more important papers read before the Institute, and the debates thereon, will be published in annual or semi-annual volumes to which those members and associates will be entitled who have paid their dues.

IV. Authors of papers are requested to notify the Secretary in advance of the meetings, giving the subject and length of their papers. Attention is also called, in this connection, to Rules 12 and 13.

MARTIN CORYELL, Secretary. Wilkesbarre, Pa.

MINING SUMMARY.

California.

GRASS VALLEY DISTRICT.

From the Grass Valley *Union* of March 1.

The month just past has not been favorable for quartz mining in this district. Water has been the detriment. Gravel mining, however, has flourished all over the country. The rainfalls have been unusually heavy and the weather has been unusually mild, thus preventing the freezing up of ditches. Water has not been a detriment to gravel miners. The heavy deposits of snow on the higher mountains will, in the ordinary course of events, cause the water supply to hold out until very late in the coming Summer. We give a few facts concerning the present situation of the Grass Valley mines.

EUREKA

mine has considerable trouble with water. Sinking the shaft continues with all possible energy, and the shaft is now down 965 feet from the surface. There is no improvement in the underground appearance of the mine. The mill has been running with fifteen stamps, but the gold yield does not pay the expenses of the mine.

IDAHO

mine never looked better at any time in its history. It is paying largely and regularly. Water has not troubled the Idaho to any extent this Winter.

NORTH STAR

is put to all it can do with its very large pumps to keep the water down. Pumping at full capacity, the North Star has not been able to keep quite even with the water which pours into the mine from the surface. They have had a few minor accidents, such as breaking a pinion or two, but duplicate parts of the machinery have always been ready at hand to remedy the accidents. The ore coming from the North Star is very good, and dividends will be kept up unless something extraordinary occurs to interfere with the systematic and pushing work now being done in the mine.

EMPIRE

mine, on Ophir Hill, has not been paying for several months, from all we can learn, and it is now in a position which forbids its paying. In other words the Empire is now not being worked, on account of a strike among the miners which have been employed in it.

KNIGHT OF MALTA

mine has made a contract by which machinery for prospecting will be put up and started at a very early day. Just now the ground is too soft for heavy machinery to be delivered at the Knight. The company will soon incorporate, and during the next Summer work will be pushed for the development of this mine, which has already promised so well.

PERRIN'S

mine is in good rock with a two-foot ledge. It is being worked under the contract system, the contract running for six months. The men who have taken the contract to mine have been and are doing good work. The contractors are making more than common wages, and are at the same time working the mine cheaper for the owners than was done under the day's work system. There should be more work done under contracts in this district. Some of the idle mines might be started up under contracts.

THE COE

is pumping to keep the water out. It is said that a contract will be let to-day for taking out rock. The last ore which came out of the Coe looked well.

HEUSTON HILL

is still being worked by thirteen practical miners, who take out tribute. They are getting out splendid ore and are making money by their operations. The good rock comes from 150 feet on the incline and will pay about $100 to the ton.

DEFIANCE

is being rapidly opened, and is showing well. It is worked under the superintendence of CON. RILEY Esq., one of the most experienced miners of the district. Sinking and drifting is being done in this mine, and the work is directed with a view to profit. Whatever and whoever can do the best work in the Defiance can get employment there.

DAISY HILL

is the promising mine of the district. Not a crushing from this mine but has paid well. The ledge now is large and shows free gold and sulphurets. The Daisy is working away with great prospects of success.

LOCATIONS.

The Idaho Company has located an extension of the Knight of Malta. The names given to those mines show that proprietors have read history and know all about

the Crusades. The Gashwiler claim is located on an extension of the Depew & Reese claims. The Gashwiler has great hopes.

GRAVEL.

The Picayune, on Randolph Hill, has done well. The tunnel has reached good paying ground. We have seen several samples of pay gravel which have come from the drift on the hill, and among them was one piece of gold worth three dollars. The company is preparing to drift, and in a few weeks will commence washing. The Picayune Company is so well satisfied with the gravel in sight that it does not propose to sell any ground.

OUTSIDE DISTRICTS.

The Pittsburg mine, near Nevada City, is in a large ledge and with better rock than has ever appeared in that mine. The Banner has been shut down for a month or more, and will not, probably, be worked until something turns up whereby mines can be worked more cheaply. Mining is continued only on the supposition that it pays to mine.

Idaho.

The Owyhee *Avalanche* of Feb. 24 says:

In making our regular trip over War Eagle mountain this week, we noticed both the ore shutes of the Oro Fino full of ore taken from the Discovery and South Discovery of that mine, which are both worked (the former by the Owyhee Co., and the latter by the Ida Elmore Co.,) through one shaft.

We also found the shaft on the Navigation mine down bout 140 feet, where it connects with a drift from the Oro Fino. This mine can now be worked very cheap, and mills about $40 a ton, which will afford the owners a handsome profit.

The Ida Elmore is being opened up as fast as possible. The 6th level drift is now run 130 odd feet north, far enough to get over the rich body of ore in No. 7. A winze is being sunk from the 6th to the 7th level, and is now down about 12 feet, but not into the good ore yet. Superintendent Minear says it will take him about two months to get the mine in proper shape for taking out ore. A winze is also being sunk from the 7th level to ascertain if the rich ore extends downwards. This winze is now down about 11 feet, showing good ore at that depth. The 7th level is still going north, but the roads will probably be breaking up before the mine can be got in good shape for yielding ore, so that but little hauling will be done before June, when we may look for flattering results,

We understand from Mr. Thomas, foreman of the North Oro Fino Mining Company, that he has struck very rich ore in the 2d level drift running north of that mine. There is no reason why the North Oro Fino should not prove equally as good as the Discovery, from which so much rich ore has been taken during the last eight years.

The Minnesota mine is yet in its swaddling clothes so far as the public know, although it is one of the oldest locations in camp. Operations on this mine only commenced last Fall, under the direction of A. P. Minear, Superintendent, and everything done about it seems to have been with a view to the future, working of the mine. Substantial buildings have been erected which are as convenient as any on the mountain. The shaft is down about 240 feet on the vein, and is well timbered, and the mine is now being opened in fine style, by running levels, sinking winzes &c. The 2d level drift north is in about 120 feet on the vein, and the south drift in the same level is in 107 feet, connecting with a winze from No. 1. There is now 80 feet of back to stope out between the 1st and 2d level. The greatest difficulty about the Minnesota now seems to be the want of hoisting works. Water is coming into the north level No. 2 so fast that Mr. Schmidt, the foreman, thinks it will be impossible to keep it down when the snow begins to melt. We understand, however, that they are expecting steam hoisting works before that time. It is more than probable that the Minnesota will ere long rank among the foremost mines in camp, notwithstanding the stock is selling in San Francisco at present for almost nothing.

The Mahogany mine is now turning out some very fine ore between the 3d and 4th levels, although the latter level does not look as well as was expected. The shaft is down for the 5th level and a place is being blasted out underneath it for a large water tank. This work will occupy two or three weeks and then a cross-cut will be run to tap the ledge. The foreman thinks the ledge is not over 15 feet from the shaft and that he will be able to cut it at that point in a month. As soon as the tank is in, sinking will be resumed again. The ore house is full of ore which will soon be hauled to the mill.

The South Chariot 4th level drift is still being run north on the vein. We hear it rumored that the main shaft is to be straightened and sunk for the 5th level, but as to the truth of it we know not, although from the way the shute of ore in the Mahogany seems to be going, we are of the opinion that the S. C. shaft should be sunk at once.

The Empire Mining Company is now fully organized with Bill Beachy, President, C. F. Balcom, Secretary and A. P. Minear, Superintendent. With such men to manage a company, and the rich ore they have in their mine, there is no good reason why it should not be a grand success. The new organization took charge of the property on the 19th inst. There is now some 75 tons of Empire ore at the Elmore mill and it pays about $150 a ton, with plenty more of the same kind coming out daily. We understand that a new shaft is soon to be commenced preparatory to extensive working the coming summer.

R. D. Walbridge has been spending the last two weeks on the Mountain making a thorough survey, for Mr. Minear, of the principal mines under his charge, and is now engaged in perfecting maps and plans which will show the exact working of the mines. This cannot fail of being a great benefit to the Companies be low.

Nevada.

HUMBOLDT MINING REGION.

We make the following extracts from a correspondence of the San Francisco *Weekly Bulletin*, dated Unionville Feb. 12th:

The business of mining, without having led to any noted discovery of late, or being now marked by any special activity, I find to be generally prosperous throughout the Humboldt country; a good many claims now being worked with fair and in some instances with very profitable results.

In proof of this prosperous condition of the mining interests here, we have the fact that the value of the precious metals produced in Humboldt county the past year approximate a million of dollars, bullion and shipping ores included; the prospect being that the yield for the current year will double that amount. This calculation is based on the assurance that the out-turn of the Arizona mine, much the largest producer in the county, will double that of last year, which reached nearly half a million, and that a corresponding increase may be counted upon from other leading sources of production. As warrant for this opinion we have the further fact that nearly all the older mines are steadily increasing their yield, while many new ones are being constantly developed to a productive condition, and considerable accessions made to the ore-crushing capacities of the district. The expectation is, therefore, not extravagant that the yield of the Humboldt mines will come hard upon two million dollars for the next twelve months.

There are now thirteen ore-crushing mills in the county, exclusive of the smelting works at Oreana, and the Auburn mill at Reno, the latter mostly fed by Humboldt ores. These several works are able to dispose of at least 200 tons of ore daily. Supposing them to operate 250 days out of 365, on ores averaging $40 per ton, we have an annual production of $2,000,000; making no account of ores shipped away, which last year amounted to $150,000. As the above is a very low estimate average of Humboldt ores, our calculation is well within bounds. . . . . The most active mining localities in the Humboldt region are found just now about Unionville, in the Star, Central, Winnemucca and the Battle Mountain districts, and in the vicinity of Dun Glen, Rye Patch and Oreana, at each of which places there is one or more mills—Oreana being the site of the smelting works before mentioned. At Unionville there are four mills, three of them belonging to the Arizona company, one of the number being supplied with an Aiken furnace is used exclusively for the working of tailings.

The Arizona mine, situated on the brow of the mountain, a mile and a half above this place, is not only the most thoroughly explored and largely productive, but also so far as appearance goes, the most valuable mine in this section of the country. Though not a massive vein—ranging only from two to five feet in thickness it is nevertheless exceedingly compact, uniform and shapely, suffering little contraction and but few displacements so far as developments have extended upon it. It pitches to the south and east, at an angle varying in its upper portions from 20 to 45 degrees, dropping more nearly to a vertical position as it goes downwards. The predominating ore is a sulphuret mixed with a chloride and much metallic silver. A large proportion of the vein matter is metalliferous, two-thirds of the entire mass being sent to the mill as a consequence—although a large amount of ore is daily raised—the mine is not being worked in a rapidly exhaustive manner. This lode has now been exploited to a depth of several hundred feet and along a much greater linear extent, showing a constant improvement in the quantity and value of the ore with depth attained. At the lowest points reached the ledge has an average thickness of four feet, the milling ores yielding, tailings included, from sixty to seventy dollars per ton, and those shipped away, from three to eight—averaging about five hundred dollars per ton. The walls of the ledge are everywhere lined with a thick clay salvage that shines like glass, denoting extensive action between their surface and that of the vein matter inclosed between them. That the Arizona lode occupies a true fissure admits of no question, this being the opinion expressed in regard to it by Commissioner RAYMOND, who recently subjected it to a careful inspection. Views not dissimilar, were entertained I believe, by Messrs. ASHBURNER and JANIN, two of our most capable mining experts, who were called upon not long since to make a professional examination of this lode. But, whatever might have been their opinions then, I am satisfied they would subscribe to the above view could they see this mine by the light shed upon it by more recent developments.

The ores from the Arizona are let down a perpendicular distance of nearly a thousand feet over a tramway laid against the side of the mountain, which slopes at an angle of nearly forty-five degrees. This work, constructed at a cost of $8,000, obviates the necessity of making a circuitous journey to and from the mine by the wagon road formerly in use, and greatly facilitates the labor of taking up supplies and getting down the ores.

OTHER MINES AND MINING OPERATIONS.

Lying, on the same ridge and not far from the Arizona are the Inskip and the Henning lodes, both actively worked and well opened up, and affording a considerable quantity of millable with some shipping ore. A little south of this place is the Peru, an early and somewhat noted location, which, with its extensions, gives employment at intervals to a small working force, and is looked upon here as a promising, not to say, already really valuable property. Feet in Peru can be used in barter and be made, on a pinch, to help settle store bills! Proceeding towards the south we pass successively the Indian and Sacramento into the Relief District, population growing more sparse and the evidences of active exertion more feeble as we recede from Unionville, the most thrifty and stirring mining locality in Humboldt. Sacramento and Indian are old districts, Relief being of more recent formation. In the latter the common blunder seems to have been committed—that of getting in a mill first and looking out for ore supplies afterwards; a mistake that is said to have imparted to the name of the district a peculiar fitness from the manner in which parties investing there were afterwards relieved of their money. It is contended, however, by those having best opportunity for knowing that there are really good ledges there, the trouble met with arising from a neglect to properly open them.

Travelling six miles north from this place we arrive in Star Canon the site of the once renowned Sheba mine shares in which sold readily at one time for five hundred dollars and upward, but afterward so depreciated that much of the stock was sold for assessments. The history of the Sheba was briefly this: Several exceedingly rich and quite extensive, but wholly isolated bodies of ore were found on this claim, imparting to it a large prospective value. Under active working these deposits were soon exhausted, and being outside the regular ore channel, a very considerable amount of exploration carried on in the neighborhood, failed to develop others to replace them, raising the question whether or not, any such really existed. Under this untoward state of things, shares in the Sheba dropped to zero, and the mine for a number of years was wholly neglected. Passing at last into the hands of JOHN C. FALL, and one or two other equally energetic men, prospecting work was resumed upon it and being steadily pushed in the proper direction, disclosed the mineral belt, from which the outlying ore bodies first found were mere detached masses. The mine now occupies a broad and fertile fissure, is turning out steadily large complements of rich ore, and is likely to justify the high expectations at first entertained of it. A small operative force is kept at work on the Sheba, the owners not caring to raise any large quantity of ore until a suitable mill is provided for its reduction. Works of limited capacity were put up last summer for concentrating the ore, but not answering a

good purpose, they were run only a short time. The ore now being extracted is separated into two classes, the poorer being retained for milling on the ground, and the other shipped to San Francisco for a market. It is of high average grade; that kept back ranging from $50 to $100 per ton, while much of that sent away runs up into the thousands. It is not necessary that shipping ores here should be assorted so closely now as aforetime to admit of their profitable transportation to market. With railroad carriage a class can be sent off with a good margin for gain which would not have paid cost of hauling on wagons over the deserts. It is for this reason that fewer small lots of extremely rich ores make their appearance in San Francisco now then was the case some years ago. The owners of the Sheba will put up a first-class mill near their property the coming summer.

There are a number of other claims in and about Star Cañon upon which a large amount of exploratory work has been done, and some of which promise good results in the future. Upon several of these, operations, for a long time suspended, have been renewed since the Sheba strike, and Star City, now nearly deserted, is likely soon to become a stirring camp once more.

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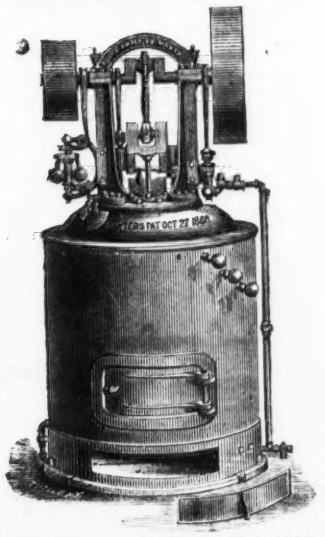

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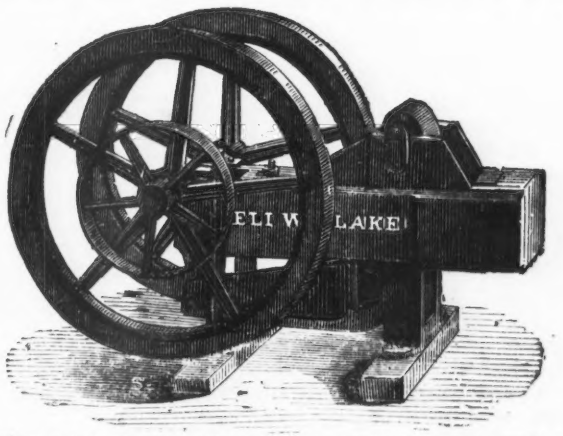

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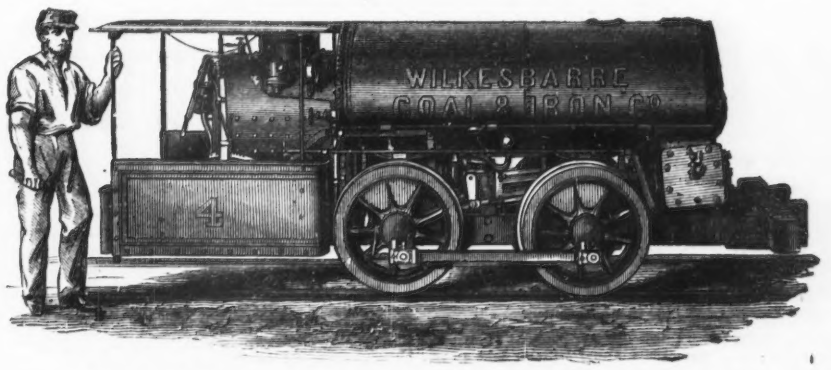

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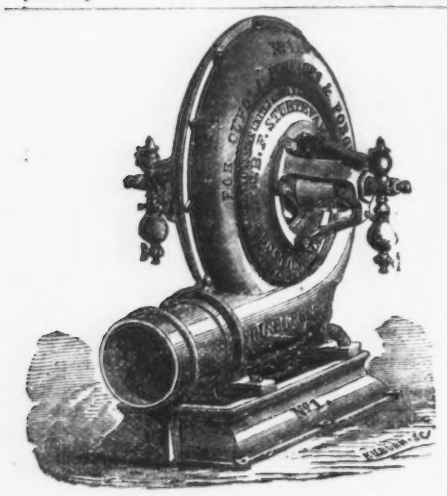

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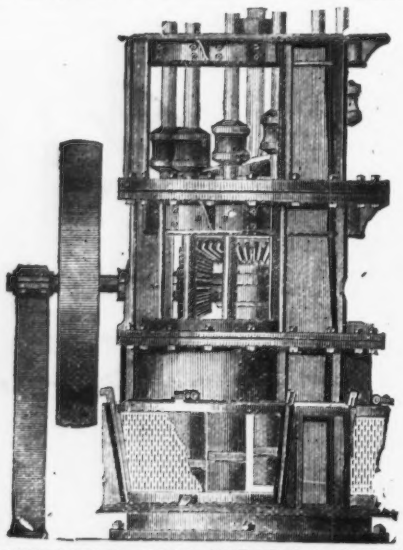

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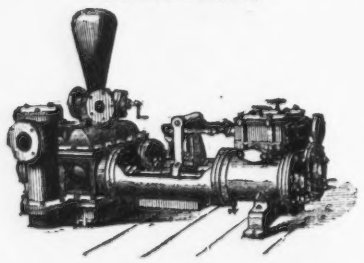

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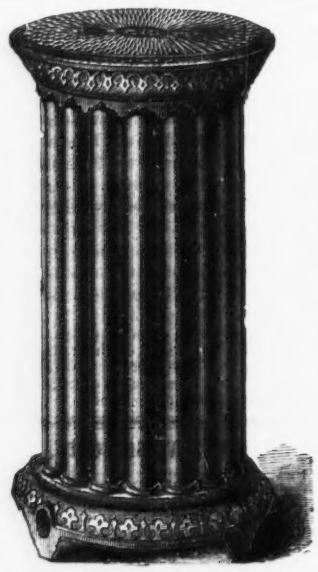

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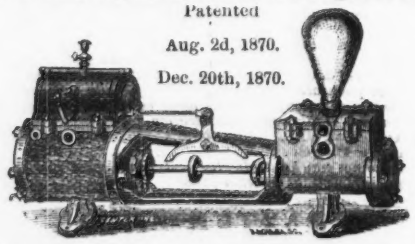

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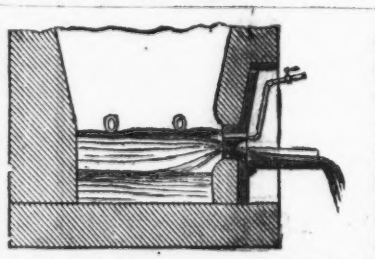

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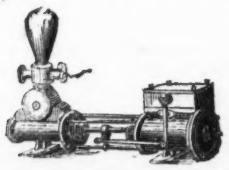

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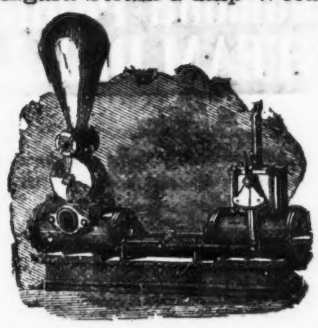

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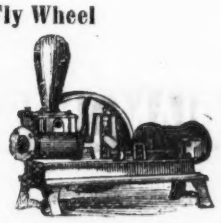

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